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# Corridor Study

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Professional Center
2363 Prospect Ave., Suite 1
Helena, MT 59601
(406) 442-7990

July 11, 1980

Mr. James W. Hahn, Chief
Planning and Research Bureau
Montana Department of Highways
2701 Prospect
Helena, Montana 59601

Subject: Draft Report - Study of the I-15 Corridor

Dear Jim:

HDR is pleased to submit the enclosed draft report for the Study of the I-15 Corridor in the vicinity of Helena, Montana. The report documents the principal work activities, analyses, and findings of the study per our contractual agreement.

We are most appreciative of the timely technical assistance and cooperation provided to us by your office and the team effort which has resulted in this draft report. We look forward to discussing with you and the Technical Advisory Committee any comments arising from the review process.

Sincerely,

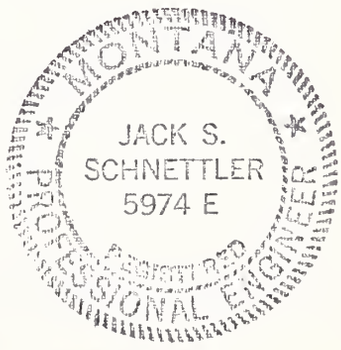
HENNINGSON, DURHAM & RICHARDSON, INC.

D. K. Hudson

David K. Hudson, P.E.
Vice President

Jack S. Schnettler

Jack S. Schnettler, P.E.
Project Manager

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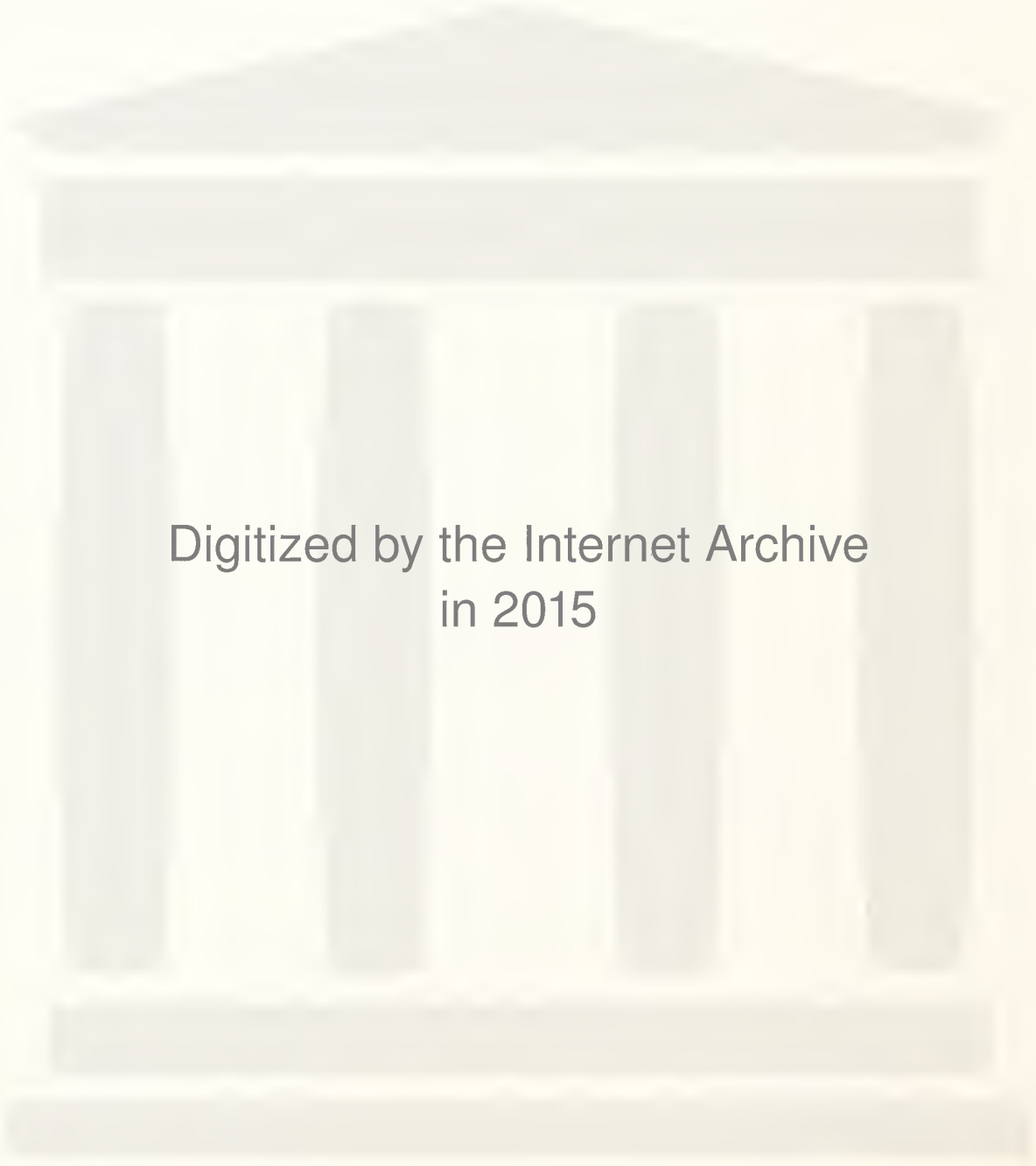
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# A STUDY OF THE I-15 CORRIDOR
## in the vicinity of
## Helena, Montana

For the

Montana Department of Highways
Planning and Research Bureau
Helena, Montana

Prepared by

Henningson, Durham & Richardson, Inc.
Helena, Montana

The opinions, findings, and conclusions expressed in this publication are those of the authors and not necessarily those of the Montana Department of Highways or the Federal Highway Administration.

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## HDR STUDY TEAM


| | |
|---|---|
| David Hudson, P.E. | Principal |
| Jack Schnettler, P.E. | Project Manager |
| David Meier | Project Engineer |
| Ken Anderson | Project Engineer |
| Kelly Seefus | Graphics |
| Jayne Palmer | Word Processing |

# CHAPTER 1
# INTRODUCTION

## 1.1 STUDY BACKGROUND

When the Interstate Highway in the Helena area, I-15, was built over 18 years ago, as an element of the national Interstate Highway program, Montana's Capital City was smaller and I-15 was essentially a new high-quality highway facility which did not play a major role in the City's transportation system. Over the years the Helena area has grown and so have traffic demands on the urban area's street system, yet I-15 still plays a relatively minor role in accommodating local travel demands.

This situation exists in part clearly due to the relation of existing land uses to I-15. However another reason may be the few access points to I-15 in the Helena area. As the Helena Urban Transportation Study process looks to the next 20 years in updating the Transportation Plan for the urban area, it must consider the role which existing transportation facilities can play in meeting future traffic demands. The need to make efficient use of all transportation resources is increasingly critical as local and State highway agencies attempt to maintain and improve our street and highway system in the face of greater needs and diminishing financial resources.

It is in this vein that this study was undertaken - specifically, to examine the feasibility of increasing the use of the I-15 corridor through the Helena urban area in order to relieve existing and anticipated traffic burdens on surface arterial streets in the Helena urban area.

The study of this issue at this point in time is appropriate since:

- a considerable increase in population is foreseen over the next 20 years
- significant commercial and residential development along the I-15 corridor is being planned or is anticipated
- the level of traffic commuting to and from Helena from surrounding areas for employment, business, and shopping continues to grow
- capacity deficiencies on existing arterials near I-15 are expected to multiply, and
- a large reserve capacity of I-15 to carry traffic presently exists.

## 1.2 STUDY OBJECTIVES

Based on these conditions, the work program for this study was formulated with these objectives:

- to review existing traffic conditions in the study area
- to formulate several alternatives for improving access to I-15

- to evaluate these alternatives with regard to traffic diversion, capital and user costs, street system impacts, and other factors

- to formulate appropriate conclusions and recommendations as a result of these analyses

- to coordinate the work effort closely with the Montana Department of Highways and the Technical Advisory Committee of the Helena Urban Transportation Study.

The purpose of this study then is to determine if increased access to I-15 will divert traffic from surface streets, which access improvements are most effective, and how the costs of these access improvements relate to alternative systems improvements required if the access to I-15 were not enhanced.

## 1.3 STUDY AREA

For the purposes of this study, that portion of the I-15 corridor lying between the Lincoln Road interchange in Lewis and Clark County north of the City of Helena and the Montana City interchange in Jefferson County was defined as the primary area of interest. The width of the corridor study was flexible so as to include those roads which experienced a change in traffic volumes under the alternatives tested. The general limits of the study area are depicted in Figure 1.1

As the figure shows, all but the southern three miles of I-15 lie within the Helena Urban Transportation Study (HUTS) area. The HUTS area is comprised of 124 zones which were grouped into the 25 alphabetically designated districts shown in Figure 1.1. The HUTS area is linked to the surrounding area through 17 external zones. External Station 134 is of particular interest since it relates to the south part of the study area. Travel between districts and external stations was examined as it relates directly to the potential for diverting traffic from arterial streets to the I-15 corridor.

## 1.4 REPORT ORGANIZATION

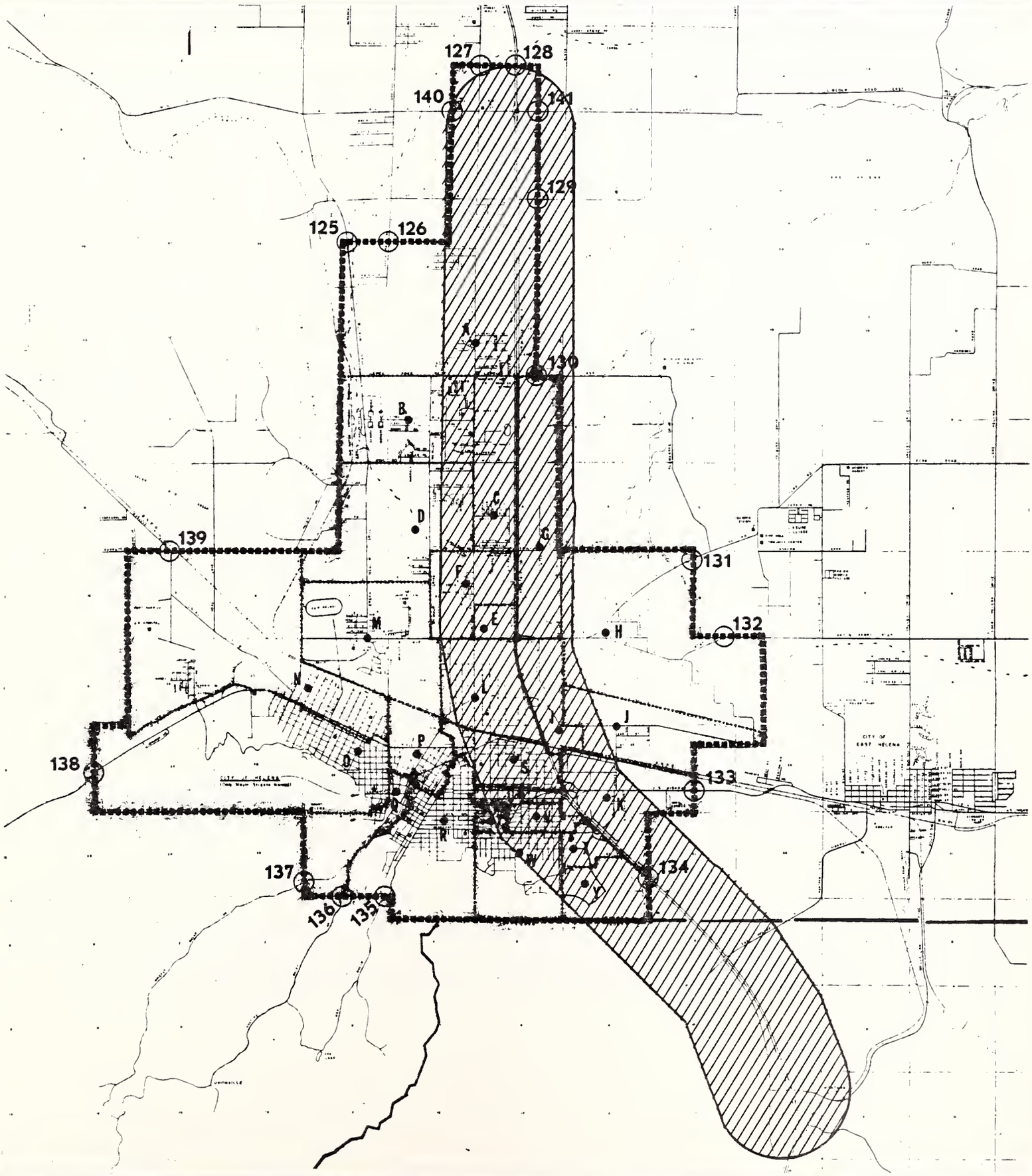
The balance of this report documents the information, assumptions, analyses, findings and conclusions utilized and developed in performing the study work tasks. Chapter 2 presents the socio-economic projects prepared by the Areawide Planning Organization and reviewed by HDR and some additional discussion of land uses surrounding the HUTS area. Chapter 3 discusses the existing and future travel patterns between districts based upon land use patterns. This chapter also compares existing (1978 for the purposes of this study) traffic volumes to projected (Year 2000) volumes for the traffic assignment to the Existing Plus Committed (E+C) Street System.

In Chapter 4, potential concepts for improving access to I-15 are proposed and screened. Selected improvement projects for further consideration are described in detail and grouped into six basic alternates. Chapter 5 provides an evaluation and comparison of the six basic alternates and other combinations. Chapter 6 presents the principal conclusions and recommendations of the study regarding access to I-15 in the Helena area.

# STUDY AREA
# figure 1.1

legend

- A — District
- O — District Centroid
- 12 — External Station
- .... — District Boundary
- --- — Study Area Boundary
- ▨ — I-15 Corridor Study Area



# CHAPTER 2

# LAND USE PROJECTIONS

The foundation for transportation planning is the distribution of land uses. The transportation modelling process uses various socio-economic statistics derived from land use as a basis for determining the magnitude and orientation of travel patterns. This study will focus its attention on the year 2000 as its planning horizon, so it is appropriate to briefly review existing and projected land use activities prepared by the Areawide Planning Organization for use in the HUTS update process.

## 2.1 PROJECTIONS FOR THE HUTS AREA

The HUTS transportation zones were grouped into 25 districts for analytical purposes. Several demographic statistics were compiled on a zonal basis by APO based anticipated land uses. For this study, three model input parameters were selected and aggregated to the district level to help identify the magnitude and direction of anticipated land uses, and hence travel patterns, for the years 1978 and 2000. The selected parameters are population (by zone of residence), employment (by zone of work), and commercial square footage. These figures are summarized in Table 2.1 by district for both years, and the percentage of future growth expected in that zone is also shown. Figure 2.1 graphically depicts districts which will experience the greatest increases.

In terms of population increases, Districts O and Y account for over 25%, and with Districts R, N, and X, comprise half of all growth. The addition of Zones K, L, M and S bring the total to about 75%. Geographically, concentrations of population growth are foreseen in southeast and southwest Helena, with lesser amounts along the southern and western fringes and in districts just north of the railroad tracks. The entire area north of Custer Avenue is expected to receive about 20% of future population, while the figure is about 30% for the area north of the railroad tracks.

Employment increases are expected primarily in Districts L and Q. Districts E, N, O, S, T, and X each would experience from 5% to 10% of future growth. These 8 districts account for 75% of new employment. About 15% would occur in both the downtown area and along Montana Avenue between Cedar Street and the railroad tracks. Other, lesser concentrations would be at Frontier Mall, the west side, the Capital complex, and the hospital/Helena Mall area.

Commercial area increases relative to 1978 conditions are to be experienced mainly at the Northlake, Frontier Mall, and Helena Mall retail centers. Each accounts for about 20% of new commercial square footage. Lesser amounts (4.5% to 6.5%) are expected in the downtown, Montana Avenue north of Custer Avenue, and in the west side.

## TABLE 2.1
## SOCIO-ECONOMIC PROJECTIONS

| District | Population | | | Employment | | | Commercial Area * | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1978 | 2000 | % | 1978 | 2000 | % | 1978 | 2000 | % |
| A | 1091 | 1390 | 2.2 | 40 | 175 | 1.1 | 55 | 435 | 1.8 |
| B | 1010 | 1393 | 2.8 | 10 | 90 | 0.7 | 0 | 260 | 1.2 |
| C | 664 | 1174 | 3.7 | 90 | 350 | 2.1 | 115 | 530 | 2.0 |
| D | 528 | 737 | 1.5 | 50 | 225 | 1.4 | 130 | 490 | 1.7 |
| E | 0 | 0 | 0.0 | 0 | 828 | 6.8 | 0 | 4139 | 19.8 |
| F | 191 | 273 | 0.6 | 30 | 390 | 3.0 | 30 | 1000 | 4.6 |
| G | 82 | 473 | 2.8 | 25 | 85 | 0.5 | 0 | 200 | 1.0 |
| H | 213 | 610 | 2.9 | 68 | 230 | 1.3 | 0 | 250 | 1.2 |
| I | 27 | 27 | 0.0 | 250 | 340 | 0.7 | 0 | 600 | 2.9 |
| J | 8 | 27 | 0.1 | 650 | 1045 | 3.3 | 35 | 235 | 1.0 |
| K | 280 | 852 | 4.1 | 775 | 1200 | 3.5 | 350 | 750 | 1.9 |
| L | 1805 | 2321 | 3.7 | 1250 | 3011 | 14.5 | 2826 | 7100 | 20.6 |
| M | 2339 | 3276 | 6.8 | 170 | 360 | 1.6 | 10 | 210 | 1.0 |
| N | 3167 | 4840 | 12.1 | 930 | 1895 | 8.0 | 120 | 585 | 2.2 |
| O | 4741 | 6784 | 14.8 | 1092 | 1841 | 6.2 | 1504 | 2766 | 6.0 |
| P | 2274 | 2437 | 1.2 | 1600 | 2025 | 3.5 | 720 | 910 | 0.9 |
| Q | 1167 | 1636 | 3.4 | 4690 | 6525 | 15.1 | 2794 | 4231 | 6.9 |
| R | 5473 | 6734 | 9.1 | 1035 | 1229 | 1.6 | 245 | 275 | 0.1 |
| S | 2153 | 2857 | 5.1 | 1318 | 2235 | 7.6 | 1195 | 1230 | 0.2 |
| T | 0 | 0 | 0.0 | 4340 | 5000 | 5.4 | 0 | 0 | 0.0 |
| U | 38 | 38 | 0.0 | 1100 | 1350 | 2.1 | 2355 | 2815 | 2.2 |
| V | 1237 | 1265 | 0.2 | 90 | 100 | 0.1 | 45 | 195 | 0.7 |
| W | 1857 | 2348 | 3.6 | 35 | 40 | 0.1 | 0 | 0 | 0.0 |
| X | 55 | 1111 | 7.6 | 493 | 1640 | 9.5 | 0 | 4200 | 20.1 |
| Y | 65 | 1685 | 11.7 | 0 | 40 | 0.3 | 0 | 0 | 0.3 |
| Total | 30470 | 44288 | 100.0 | 20131 | 32249 | 100.0 | 12529 | 33406 | 100.0 |
| Change | | 13818 | | | 12118 | | | 20877 | |
| % Change | | +45.% | | | +60.% | | | +167.% | |

* 100 square foot units of Gross Leasable Area

NOTE: Percentages shown are that district's share of the total increase in that socio-economic variable over the 20 year period, not the percent increase in that zone.

Within the HUTS area, these increases in population, employment, and shopping facilities occur in part along I-15 and along Montana Avenue, which should tend to support the concept of improved interstate highway access. Little new growth is foreseen east of I-15, however, so that travel in the north-south axis will continue to be largely a one-sided affair to the west of I-15. It should be noted, though, that should a new interchange be justified at some location, it may have the effect of shifting land use patterns in a way which would tend to reinforce its existence.

## 2.2 GROWTH IN THE HELENA VICINITY

A considerable amount of traffic in the immediate area is of the commuting variety from outlying towns, subdivisions, and developments surrounding Helena. About half of this traffic presently enters the HUTS area from York Road, Canyon Ferry Road, and U.S. 12. About 14% use I-15 from the south, and 15% approach from the west and southwest. Nearly a fourth of outside traffic enters or leaves the area at points north of Sierra Road. This externally generated traffic tends to reflect the magnitude of development in each direction from Helena.

The north valley area and I-15 north of Helena account for external traffic in that direction. To the south via I-15 is northern Jefferson County and its several developments bordering I-15: Saddle Mountain Estates, Blue Sky Heights, Forest Park Estates, Gruber Estates and others. The east valley area contains the City of East Helena as well as several scattered residential developments. The role of accounts in part for the external traffic.

The appeal of country living in proximity to urban resources has supported the growth of the fringe and more remote residential areas. The continued growth of these areas is being threatened by rising gasoline prices, however. From a traffic forecast standpoint, external traffic has been projected by extrapolation of recent growth trends to the Year 2000. With this approach it is implicit that the magnitude of traffic growth due to outlying areas, is reflected within the mathematically estimated forecast. Because it comprises about 27% of all daily trips within, into, or out of the HUTS area, external trips may play a significant role in justifying improved interstate access.

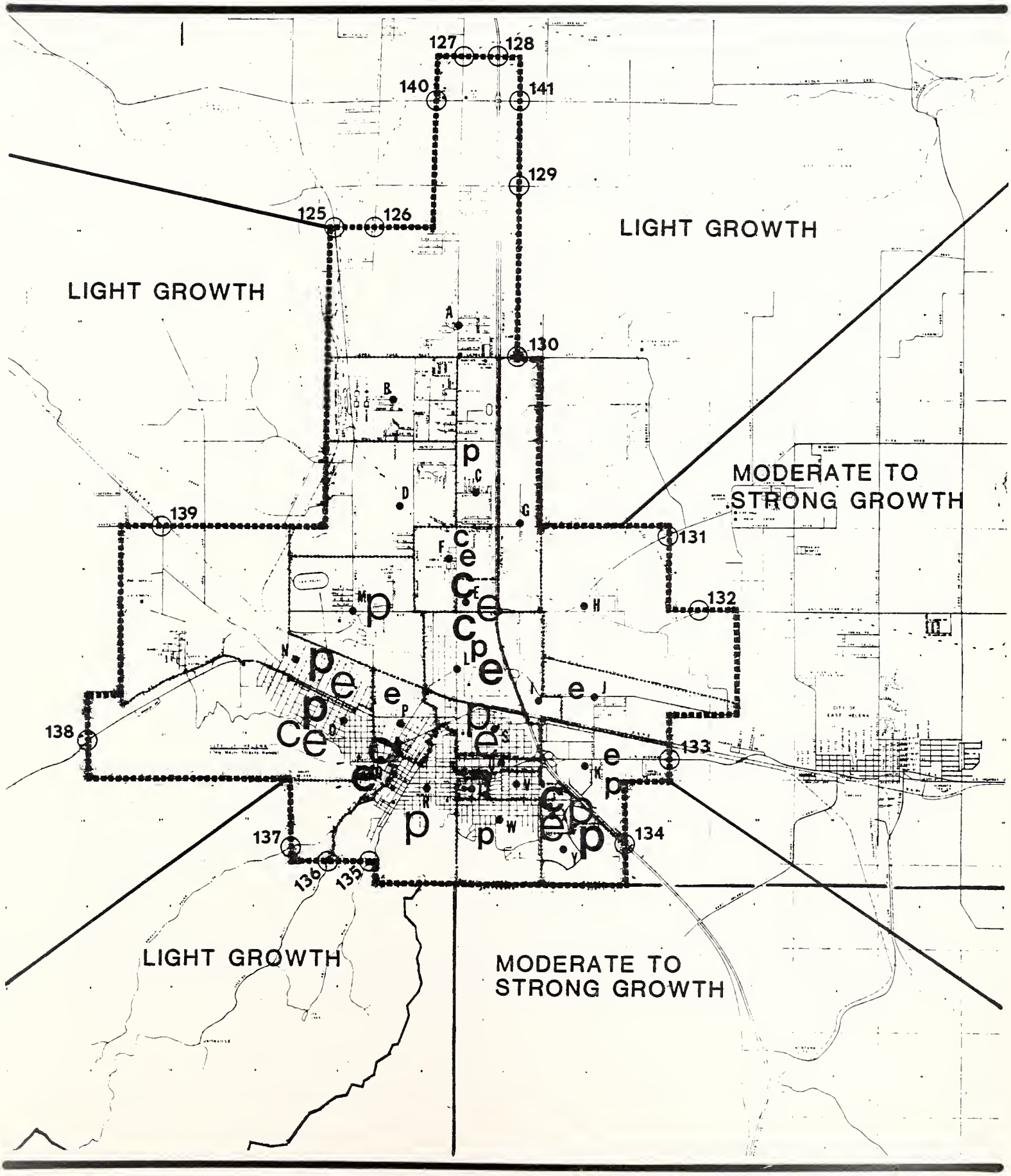
Figure 2.1 shows the generalized growth potentials in various sectors surrounding the HUTS area. Generally the growth, essentially residential, is anticipated to be relatively light in all directions except to the east and south. These trends are consistent with activity and external station traffic projections.

Of particular interest is the growth in northern Jefferson County because of its reliance on I-15 via the Montana City interchange for access into Helena. Referring to the Jefferson County Comprehensive Plan (1976) Census Enumeration Districts 002 and 003 were estimated to contain about 4,100 persons residing in 1,078 dwelling units. A mailbox survey by HDR indicated there were nearly 600 dwellings in the immediate I-15 corridor extending south from the Montana City interchange to the Clancy area. These residences are within what could be considered tolerable commuting distance from a travel cost standpoint.

# legend

ppp Population Growth
eee Employment Growth
CCc Commercial Growth

# 1978-2000 GROWTH AREAS (HUTS) figure 2.1



A review of projected population increases for Jefferson County is, within the ability to accurately forecast population increases in this volatile area, relatively consistent with the mathematically projected increase in external station traffic through Station 134 of the HUTS area. Thus, continued growth in northern Jefferson County subdivisions explains anticipated traffic increases on I-15 over the next 20 years.

Besides the more established outlying residential subdivisions, a significantly sized planned development is being envisioned between the City of Helena and the Montana City interchange, and straddling I-15. Named Crossfire by its developer, this development, if even only moderately successful, would cause a considerable shift in travel patterns and traffic volumes on specific roads and streets in the south part of the study area. A small portion of this total development lies within the HUTS area and is generally platted and partially developed at present. The HUTS demographic projections have incorporated the residential and commercial land uses envisioned for this portion of Crossfire.

However, it is reasonable to state that the general concept of Crossfire is not reflected in HUTS external station traffic projections. As stated, the review of traffic projections on I-15 to and from northern Jefferson County would appear to allow for a continuation of current residential growth south of the Montana City interchange, but not for any significant activity in Crossfire.

It was therefore decided at one of several review meetings with the TAC to test the possibility of significant development in the Crossfire area. The following scenario was formulated for use by the consultant in evaluating the impacts of Crossfire development. An estimated 4,600 persons would reside in 1,643 dwelling units in an area west of I-15 extending from southeast Helena towards East Helena Road. An estimated 87,500 square feet of retail space would exist with this new development.

A manual analysis of this traffic parallelling this study's basic analyses is presented in Chapter 5. The analysis of Crossfire is handled in this fashion for several reasons. First and foremost is the fact that the inclusion of this magnitude development on Helena's fringe necessarily presumes that it would divert development from elsewhere within or in the vicinity of the HUTS area. Since the test population for Crossfire is about one-third of the total population increase in the HUTS area over the next 20 years, inclusion of this growth scenario without the deletion of growth elsewhere is an important constraint to be recognized. Incorporation of this test scenario in a journalized manner would have required certain policy decisions and considerable work in revising the trip distribution tables for the computer transportation model. Moreover, the redistribution of residential growth from one area to another in the magnitude involved here could effect significant changes in forecast traffic volumes in the areas affected. Another reason for the parallel analysis was the difficulty in structuring comparable alternatives.

Since it was not possible to reallocate residential growth and reassign traffic to the network, a manual approach was adopted. In this technique the magnitude and orientation of traffic which would arise from the Crossfire scenario was determined by comparison to Zone 120 of the HUTS area which is envisioned to contain similar types of residences, and which is similarly situated to the rest of the urban area.

The traffic generated by Crossfire was then distributed to the various street systems to be tested as "add on" traffic superimposed upon the basic traffic forecasts for the street system. Because of the limited access paths to the Crossfire site, this approach enabled some insights into the traffic requirements. However, the limitations of this approach must be borne in mind when formulating conclusions.

## 2.3 SENSITIVITY OF TRAFFIC PROJECTIONS

Two facts bear restatement at this point. First, the traffic assignments for the year 2000 are intended to serve as a tool, an aid, to help the community better plan its transportation system -- in short, to help it allocate its transporation funds in an effective manner that addresses existing and foreseeable needs.

Secondly, the resulting traffic assignments are sensitive to the general allocation of community growth, for example, significant residential or industrial development in one sector or corridor and not in another. The assignments are likewise sensitive to the placement of significant individual land uses such as major schools, shopping centers, and factories. Such major land uses have a profound impact on the level of traffic and the flow patterns on arterial streets around such sites.

The traffic assignments presented in this study for each of several alternates are predicated on the same basic land use pattern for the year 2000 as determined by local planning agencies and communities, based upon the best available information at this point in time. Land use development of prominence which are foreseen along the I-15 corridor are a shopping mall at Montana and Custer Avenues, new employment centers along Montana between Custer and Lyndale Avenues, a shopping center at Colonial and Beltview Drives, and considerable residential activity in southeast Helena, plus the potential for development in Crossfire.

The prospect of these developments has raised concerns about the ability of existing arterial streets to handle future traffic and in large measure necessitated this study. Keeping in mind the nature and function of the transportation planning process and the land use projections which underlie it will put the findings and recommendations of this report in proper perspective.

# CHAPTER 3

# EXISTING AND PROJECTED TRAVEL DEMANDS

This chapter presents a summary of the travel demands generated by existing (1978) and anticipated (2000) land uses, and in discussion of traffic patterns on the existing street system.

Trip distribution for both 1978 and 2000 were processed and reviewed to identify the orientation of existing and projected travel patterns in terms of several trip types:

- home-based work
- home-based other
- nonhome-based
- external to internal
- external to internal

Truck trips were deleted from consideration because they constituted a very small percentage of all trips. Zonal trip tables were converted to district trip tables so that travel patterns could be more easily identified. District trip tables were prepared for each of the five trip types for both 1978 and 2000. From these tables, the principal travel patterns within each trip category were graphically portrayed.

## 3.1 EXISTING TRAVEL PATTERNS

The existing travel patterns for 1978 are illustrated in Figures 3.1 to 3.5 by trip type. Table 3.1 below tabulates the number of trips represented by each figure.

### TABLE 3.1

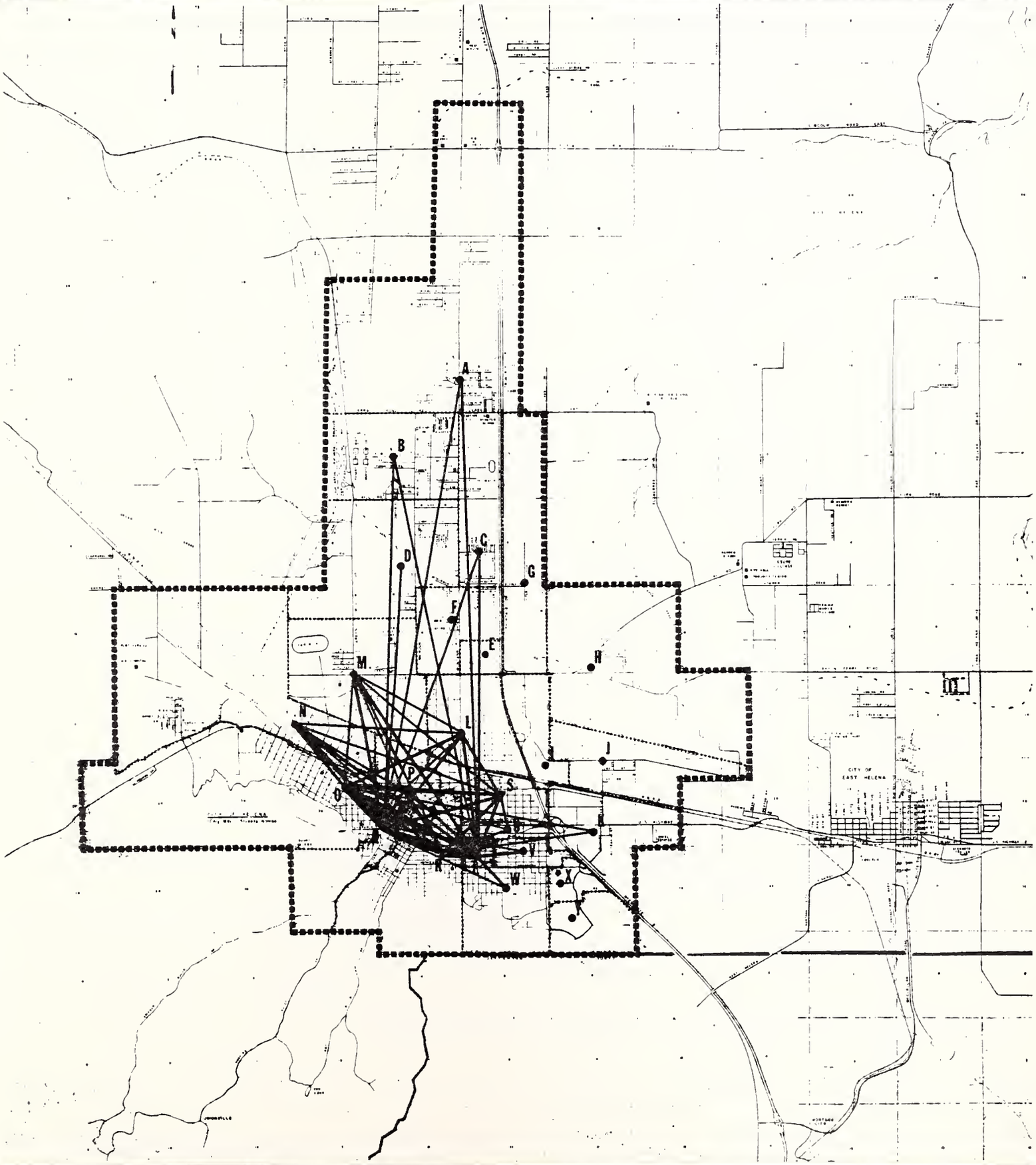
### EXISTING TRIPS BY TYPE

| Trip Type | 1978 Daily Trips |
|---|---|
| Home-based work | 22,640 |
| Home-based other | 52,718 |
| Nonhome-based | 24,347 |
| External to internal | 27,947 |
| External to external | 2,563 |
| Truck | 1,225 |
| Total | 131,440 |

# 1978 HOME-BASED WORK TRIPS
# figure 3.1

## legend

| | | | |
|---|---|---|---|
| A | District | | Less Than 100 Trips |
| ● | District Centroid | — | 100-249 Trips |
| 12 | External Station | — | 250-499 Trips |
| .... | District Boundary | — | 500-1000 Trips |
| --- | Study Area Boundary | — | More Than 1000 Trips |

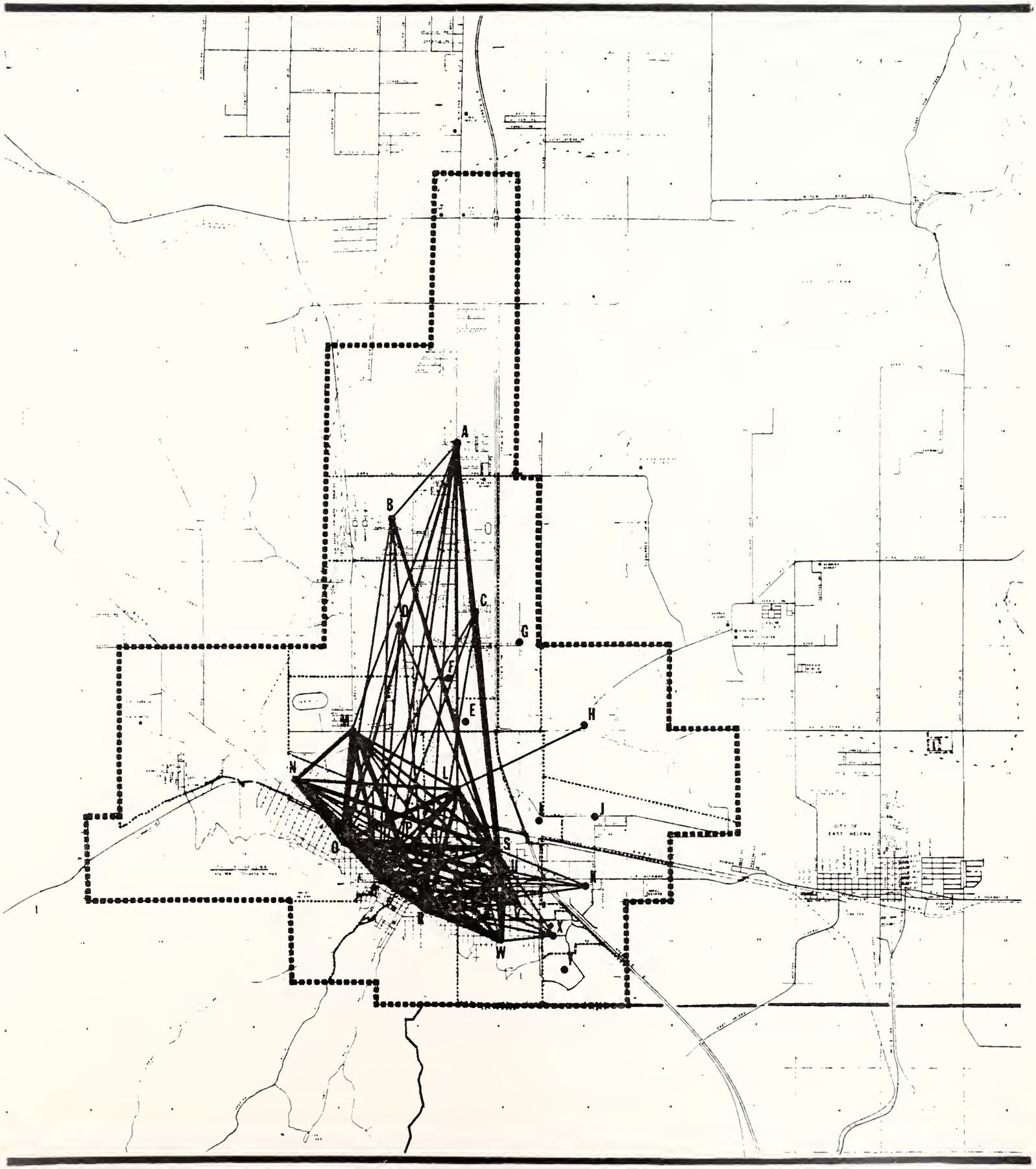


# 1978 HOME-BASED OTHER TRIPS
# figure 3.2

## legend

- A — District
- ● — District Centroid
- 12 — External Station
- ---- — District Boundary
- ---- — Study Area Boundary

- Less Than 100 Trips
- — 100-249 Trips
- — 250-499 Trips
- — 500-1000 Trips
- — More Than 1000 Trips

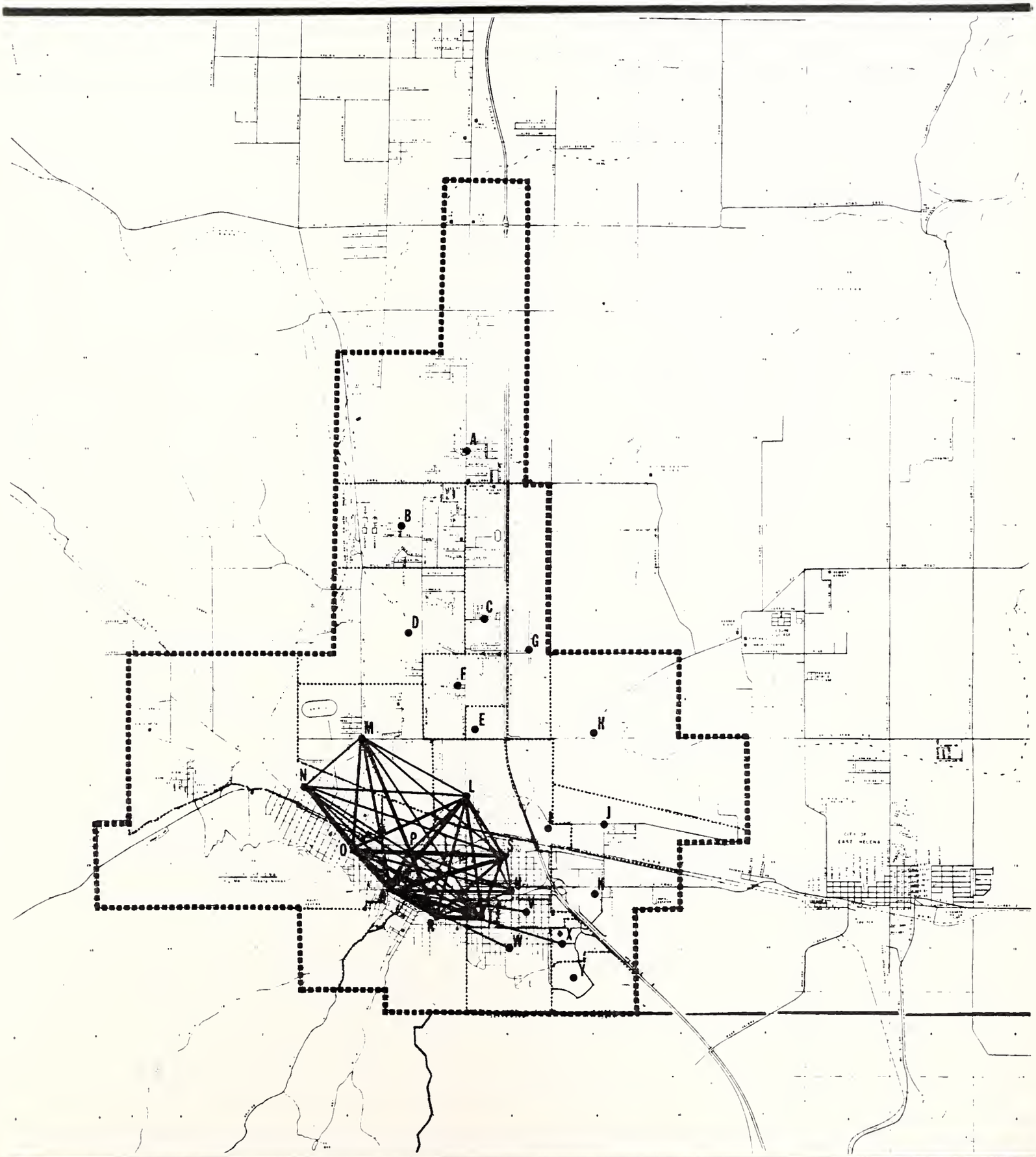


# 1978 NONHOME-BASED TRIPS
# figure 3.3

## legend

- A — District
- ● — District Centroid
- 12 — External Station
- --- — District Boundary
- --- — Study Area Boundary

- — Less Than 100 Trips
- — 100–249 Trips
- — 250–499 Trips
- — 500–1000 Trips
- — More Than 1000 Trips

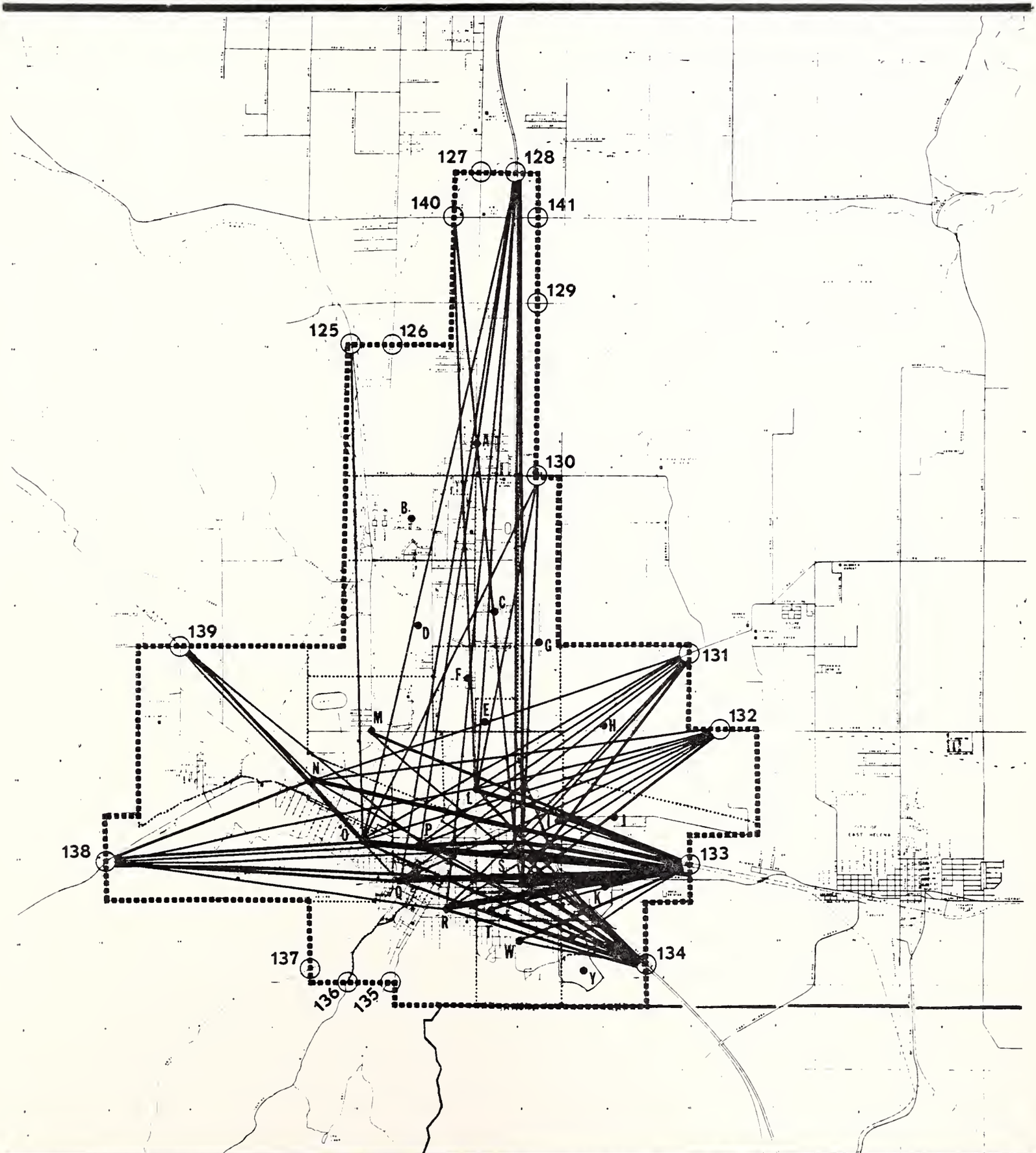


# 1978 EXTERNAL TO INTERNAL TRIPS figure 3.4

## legend

- A — District
- ● — District Centroid
- 12 — External Station
- ---- — District Boundary
- ---- — Study Area Boundary

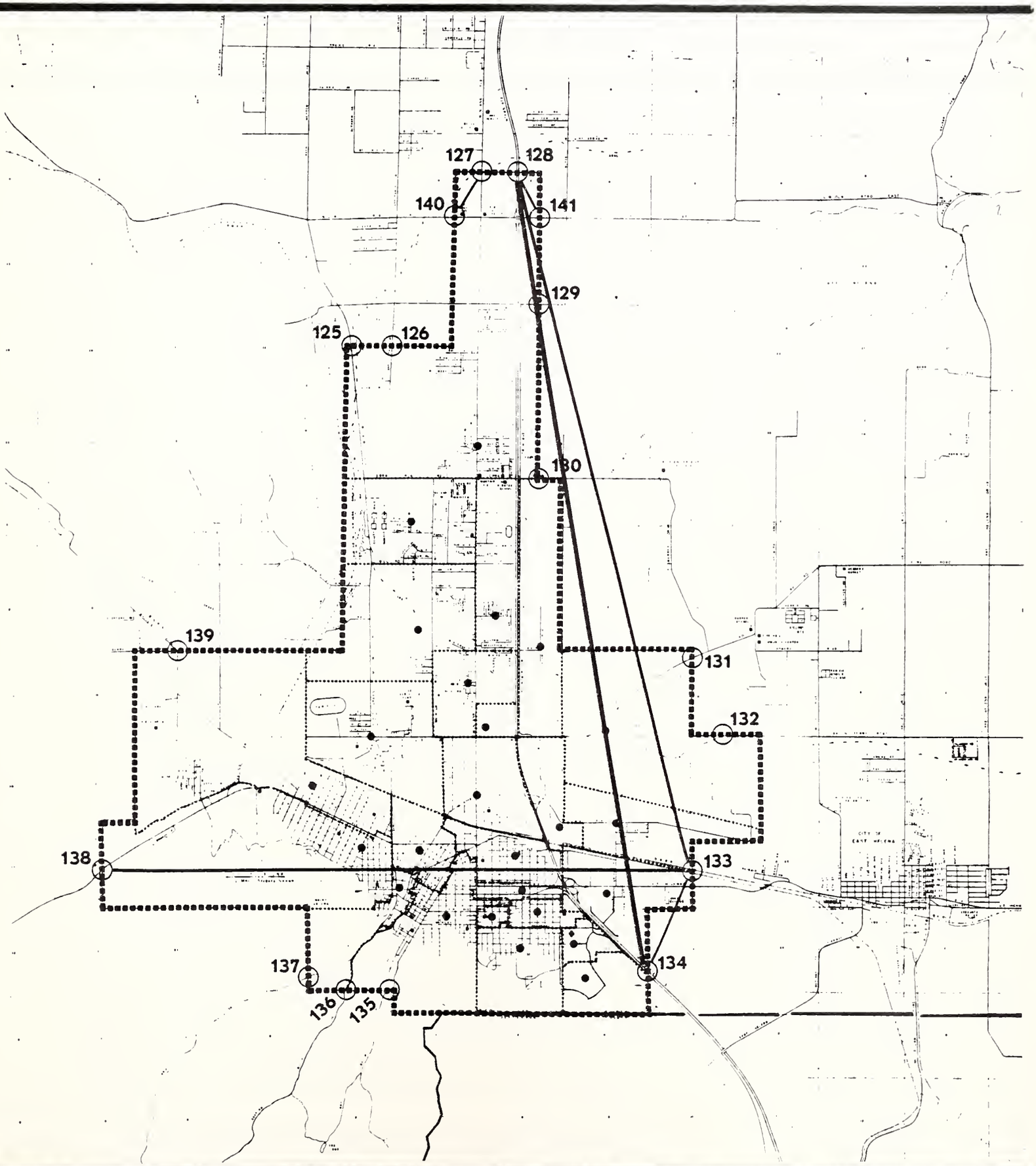
- Less Than 100 Trips
- — 100–249 Trips
- — 250–499 Trips
- — 500–1000 Trips
- — More Than 1000 Trips



# 1978 EXTERNAL TO EXTERNAL TRIPS figure 3.5

## legend

| | | | |
|---|---|---|---|
| A | District | | Less Than 100 Trips |
| ● | District Centroid | — | 100–249 Trips |
| 12 | External Station | — | 250–499 Trips |
| --- | District Boundary | — | 500–1000 Trips |
| --- | Study Area Boundary | — | More Than 1000 Trips |



Significant observations from these figures include the following points:

1. The most significant home-based work patterns relating to I-15 are trips from the north valley to the State Capital and travel from mid-city to employment east of I-15. Obviously, other district linkages would relate to I-15 in some fashion, but do not amount to more than 100 trips per day.

2. Home-based other trips relate in part to shopping trips, and the proximity of several commercial areas to I-15 is evident. There are numerous linkages paralleling I-15, while few crossing it.

3. Nonhome-based trip patterns presently would offer little support to improved interstate access.

4. External-to-internal trip patterns relate very strongly to travel on I-15, although present access patterns may not be conducive to its use. This trip type relates most significantly of all trip types to travel across the I-15 corridor as well. It might be argued that the burden of serving these externally generated trips should be carried more equitably by the interstate where feasible because of their magnitude.

5. Existing external-to-external trip linkages of any consequence already use I-15 and U.S. 12, which are regional through-type routes. Thus, this trip type will not be a significant concern.

## 3.2 FUTURE TRAVEL PATTERNS

Based on the land use and external station projections discussed earlier, future (Year 2000) trip tables were developed to represent future Helena area travel. Figures 3.6 to 3.10 depict projected travel patterns by trip type for each trip type. Table 3.2 summarizes the level of trip making shown in each figure.

### TABLE 3.2

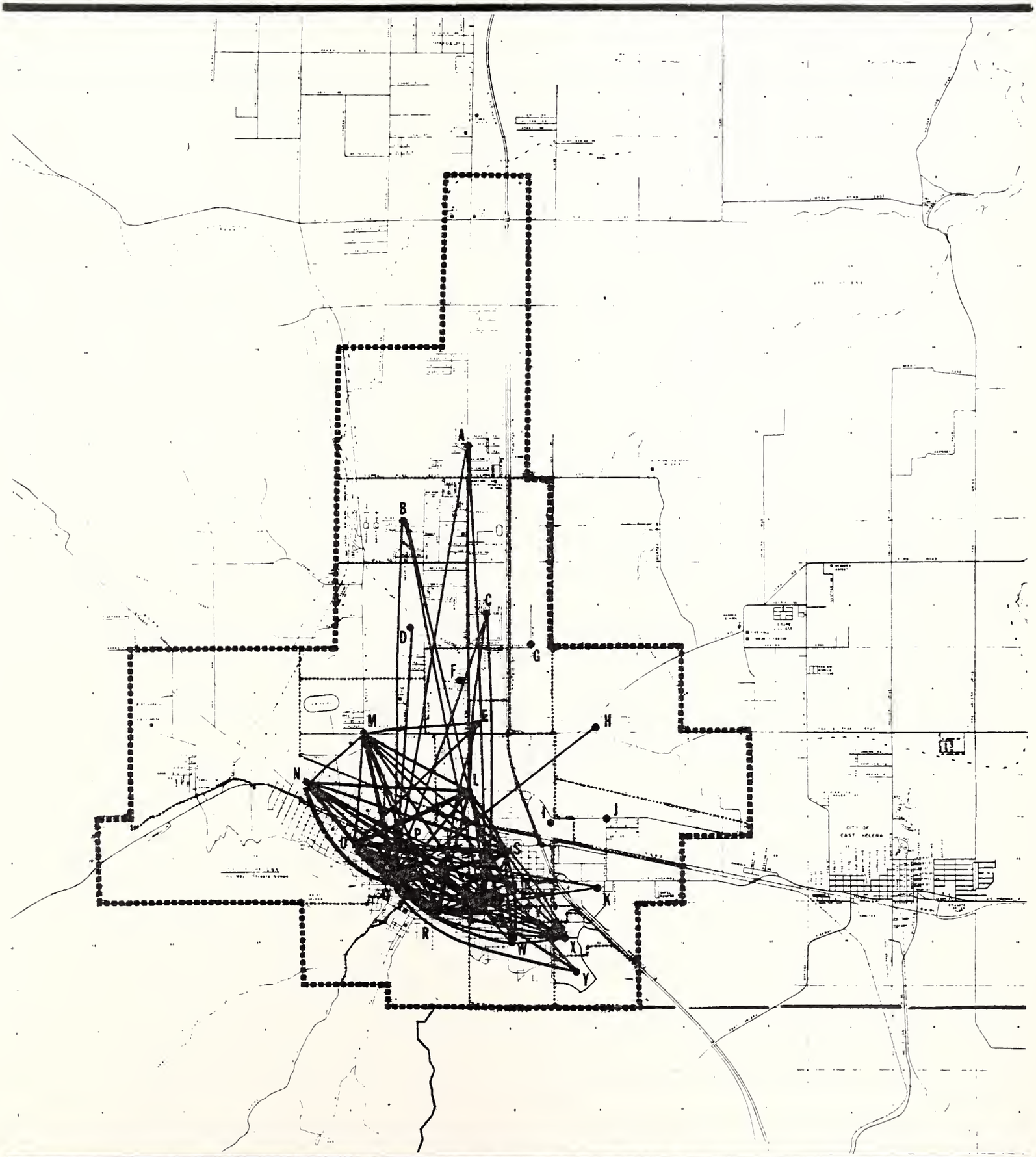
### FUTURE TRIPS BY TYPE

| Trip Type | 2000 Daily Trips | % Increase Over 1978 |
|---|---|---|
| Home-based work | 32,660 | 44% |
| Home-based other | 76,037 | 44% |
| Nonhome-based | 39,299 | 61% |
| External to internal | 40,552 | 45% |
| External to external | 4,094 | 60% |
| Truck | 1,779 | 44% |
| Total | 194,421 | 48% |

# 2000 HOME-BASED WORK TRIPS
# figure 3.6

## legend

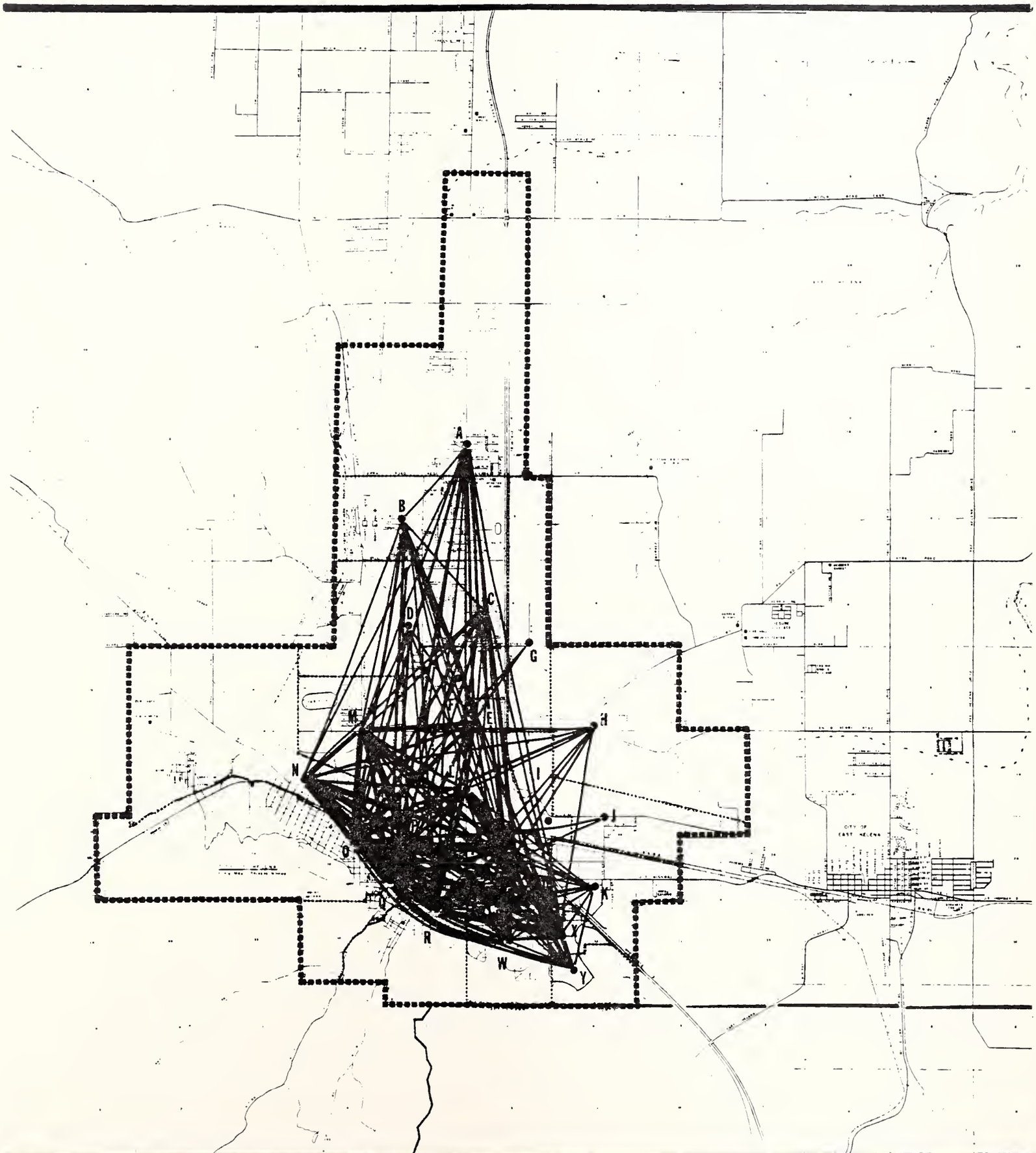
| | | | |
|---|---|---|---|
| A | District | | Less Than 100 Trips |
| ● | District Centroid | — | 100-249 Trips |
| 12 | External Station | — | 250-499 Trips |
| .... | District Boundary | — | 500-1000 Trips |
| --- | Study Area Boundary | — | More Than 1000 Trips |



# 2000 HOME-BASED OTHER TRIPS
# figure 3.7

## legend

| | | | |
|---|---|---|---|
| A | District | | Less Than 100 Trips |
| ● | District Centroid | — | 100-249 Trips |
| 12 | External Station | — | 250-499 Trips |
| --- | District Boundary | — | 500-1000 Trips |
| --- | Study Area Boundary | — | More Than 1000 Trips |

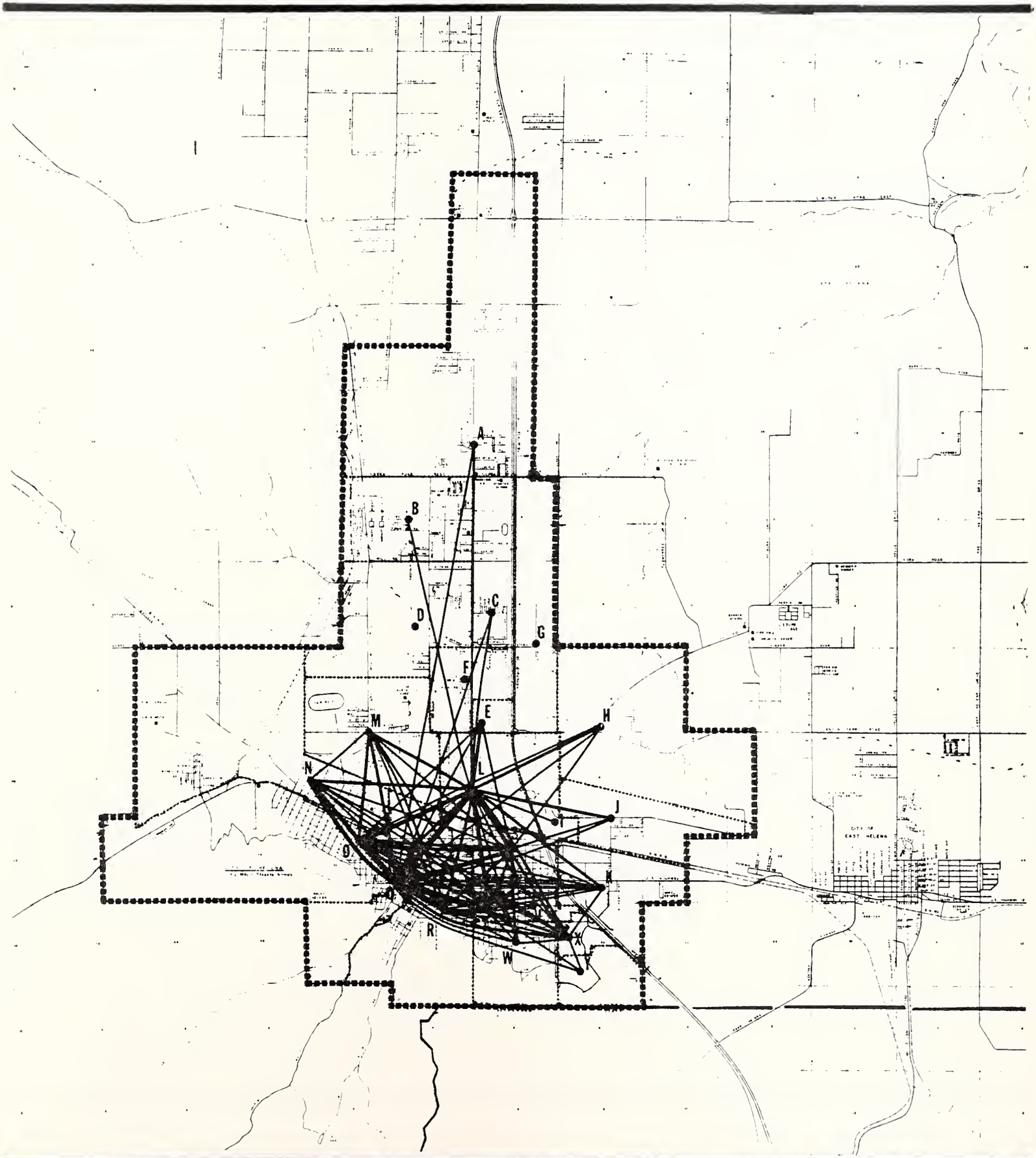


# 2000 NONHOME -BASED TRIPS figure 3.8

## legend

- A — District
- ● — District Centroid
- 12 — External Station
- ···· — District Boundary
- ---- — Study Area Boundary

- Less Than 100 Trips
- — 100-249 Trips
- — 250-499 Trips
- — 500-1000 Trips
- — More Than 1000 Trips

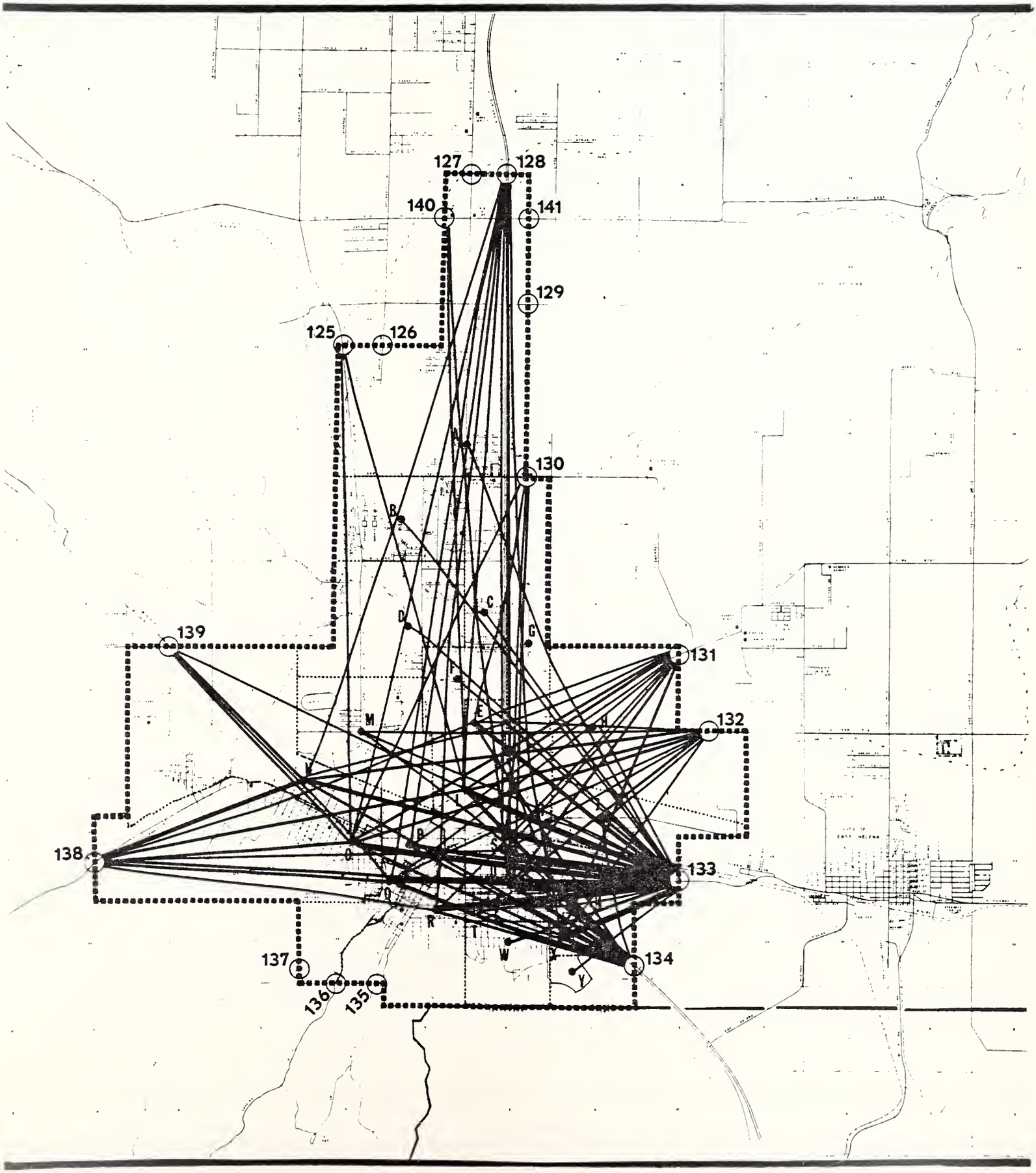


# 2000 EXTERNAL TO INTERNAL TRIPS figure 3.9

## legend

| | |
|---|---|
| A | District |
| ● | District Centroid |
| 12 | External Station |
| ---- | District Boundary |
| ---- | Study Area Boundary |

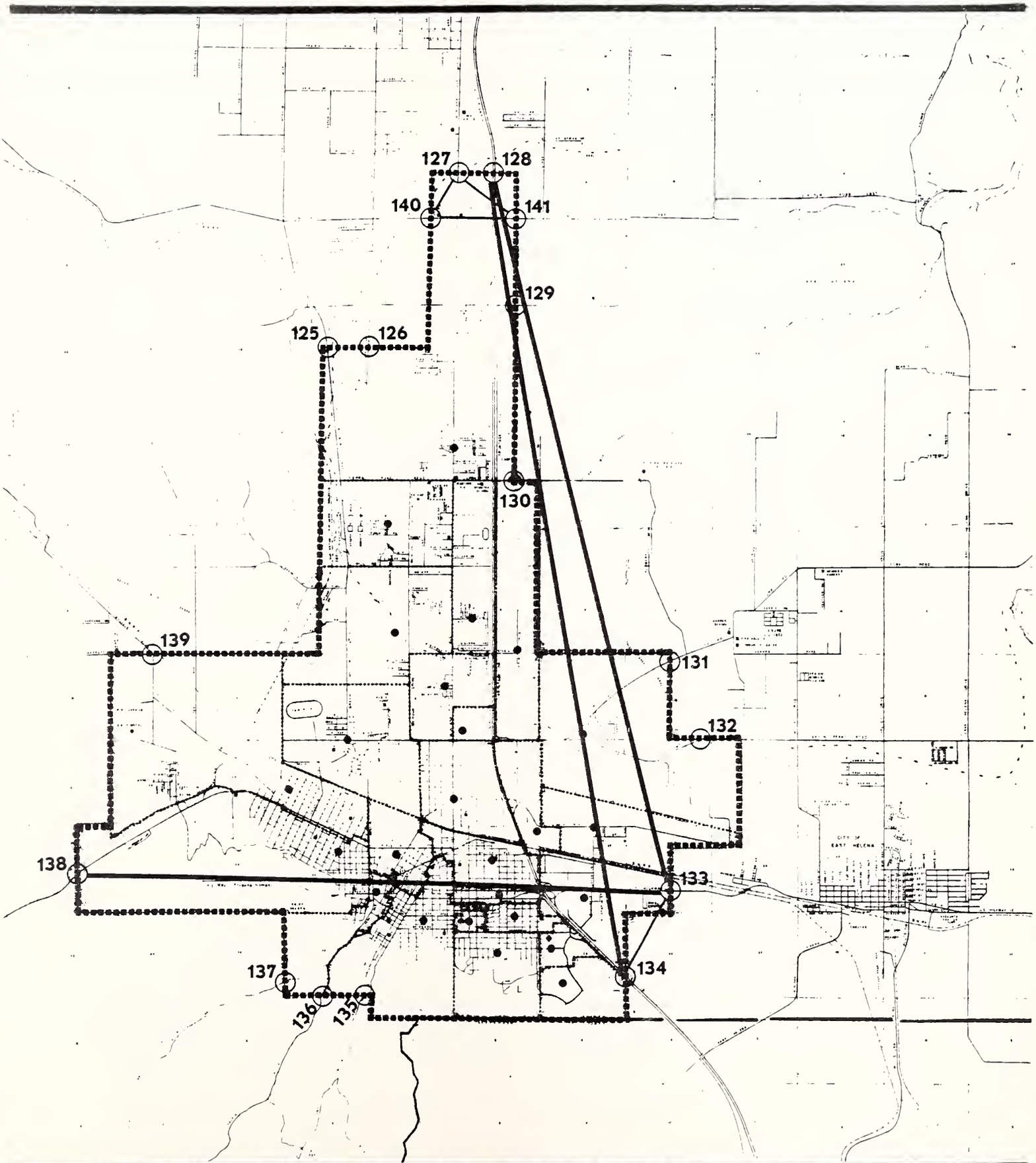
| | |
|---|---|
| — | Less Than 100 Trips |
| — | 100-249 Trips |
| — | 250-499 Trips |
| — | 500-1000 Trips |
| — | More Than 1000 Trips |



# 2000 EXTERNAL TO EXTERNAL figure 3.10

## legend

| | | | |
|---|---|---|---|
| A | District | | Less Than 100 Trips |
| ● | District Centroid | — | 100-249 Trips |
| 12 | External Station | — | 250-499 Trips |
| ---- | District Boundary | — | 500-1000 Trips |
| —— | Study Area Boundary | — | More Than 1000 Trips |



A comparison of companion 1978 and 2000 trip pattern illustrations suggests that to a large degree, future trip making amounts to "more of the same" in that no drastic shift in travel linkages is apparent. Rather, existing linkages appear accentuated in comparison. The major population, employment, and commercial area increases reviewed earlier, in fact, were clustered within or close to the existing corporate limits of Helena. Certainly "more of the same" would tend to place greater potential demands on I-15.

A recap of significant aspects of these figures includes these points:

1. Home-based work trips from the north part of the Helena area to the State Capital complex are somewhat greater, but offer reserved potential for diversion to I-15 since the travel time savings on the interstate would be offset by the extra time to and from I-15. This is because the bulk of all developed land lies to one side of the interstate.

2. The home-based other trips offer significant diversion potential because of the presumed creation of new or expanded shopping opportunities close to I-15.

3. As with 1978 nonhome-based travel, those in 2000 relate very little to the I-15 corridor.

4. The relation of external-to-internal trips is more pronounced in 2000 than in 1978 basically because of the nearly 50% increase in magnitude. As stated before, this trip type clearly relates most strongly to I-15, with the issue being one of keeping the external trips on I-15 for as long as possible before diverting to ultimate destinations. The barrier/funnel effect of few interstate crossing or access points can be visualized as well.

5. As for 1978, external-to-external trips do not relate to the diversion of traffic to I-15 since much of it is oriented to I-15 already. It is evident that considerable surface traffic could be diverted to I-15 without jeopardizing the traffic service provided to this trip type.

Table 3.3 summarizes the existing and future external station volume counts and shows all these stations with higher volumes. Traffic through external stations is forecast to increase about 47% or 1.78% annually.

## 3.3 EXISTING TRAFFIC PATTERNS

The previous section discussed the level and orientation of travel demands between various districts. It is helpful to review the use of existing streets in satisfying these travel demands in order to better understand the potential for diversion of traffic to I-15. It should also be remembered that for the most part, motorists will utilize that route between two points which requires the individually perceived least amount of travel time. The following summary of travel patterns is somewhat generalized but does adequately account for principal travel patterns and routing choices of motorists. The approach is to concentrate on a few specific destinations and explain approach paths to those sites.

TABLE 3.3
EXTERNAL TRAFFIC SUMMARY

| Sector and Station | | 1978 ADT | 2000 ADT | Increase | Annual% Increase |
|---|---|---|---|---|---|
| East | 131 | 2250 | 3320 | | |
| | 132 | 2220 | 3280 | | |
| | 133 | 11300 | 16670 | | |
| | Subtotal | 15770 | 23270 | 7500 | 1.78 |
| South | 134 | 4680 | 6870 | 2190 | 1.76 |
| Southwest | 135 | 140 | 210 | | |
| | 136 | 570 | 840 | | |
| | 137 | 210 | 320 | | |
| | Subtotal | 920 | 1370 | 450 | 1.83 |
| West | 138 | 2780 | 4100 | | |
| | 139 | 1110 | 1630 | | |
| | Subtotal | 3890 | 5730 | 1840 | 1.78 |
| North | 125 | 680 | 1010 | | |
| | 126 | 110 | 160 | | |
| | 140 | 1190 | 1770 | | |
| | 127 | 820 | 1210 | | |
| | 128 | 3000 | 4430 | | |
| | 141 | 760 | 1120 | | |
| | 129 | 260 | 380 | | |
| | 130 | 980 | 1440 | | |
| | Subtotal | 7800 | 11520 | 3720 | 1.79 |
| GRAND TOTAL | | 33060 | 48760 | 15700 | 1.78 |

The basic travel patterns described above are depicted in Figures 3.11 and 3.12 for illustrative purposes. It should be noted that depending on the origin/destination pair motorists will not always follow the same route between the origin and destination. One reason is that presently there are some intersections at which certain movements are difficult, at least during peak hours.

Among these locations are Montana Avenue at the multiple track grade crossing, the Montana Avenue/Lyndale Avenue/Helena Avenue intersection, particularly in the southbound direction, the southbound ramp from I-15 at its junction with US 12, and the terminus of the northbound ramp from I-15 to Cedar Street opposite Washington Avenue, and the Montana Avenue intersections at Cedar Street and Custer Avenue.

To reach work and shopping destinations in the south part of Helena several routes may be utilized. From the North Valley area (north of Custer) to the CBD, most traffic uses North Montana to Custer and south on Benson, and North Montana or I-15 to Cedar Street and south into the CBD. To the Capital complex, motorists generally would use Montana Avenue, with a small portion using I-15 for destinations on the east side of the Capital area. The Capital Hill Shopping Center is reached via either approach. Closer to I-15 and east on US 12, traffic from the north valley uses North Montana to Cedar Street then North Montana to 11th Avenue or Cedar Street to I-15 onto 11th Avenue. Traffic from the area south of Lincoln Road will use Sierra Drive to the west frontage road and south onto Washington Street to I-15 at Cedar Street.

To the same south side destinations, traffic from the York Road/Canyon Ferry Road area utilize Washington Street from Custer Avenue to Cedar Street, taking I-15 south to Prospect Avenue and on west. A similar routing would be followed from this area to the Capital Hills Shopping Center and to other southeast Helena destinations. To the CBD, traffic from this area would follow Custer Avenue to North Montana Avenue to North Main Street. To areas along US 12 east of I-15, traffic would follow Washington Street to Cedar Street, then to either I-15 south to US 12 or east on Airport Road to Carter Lane.

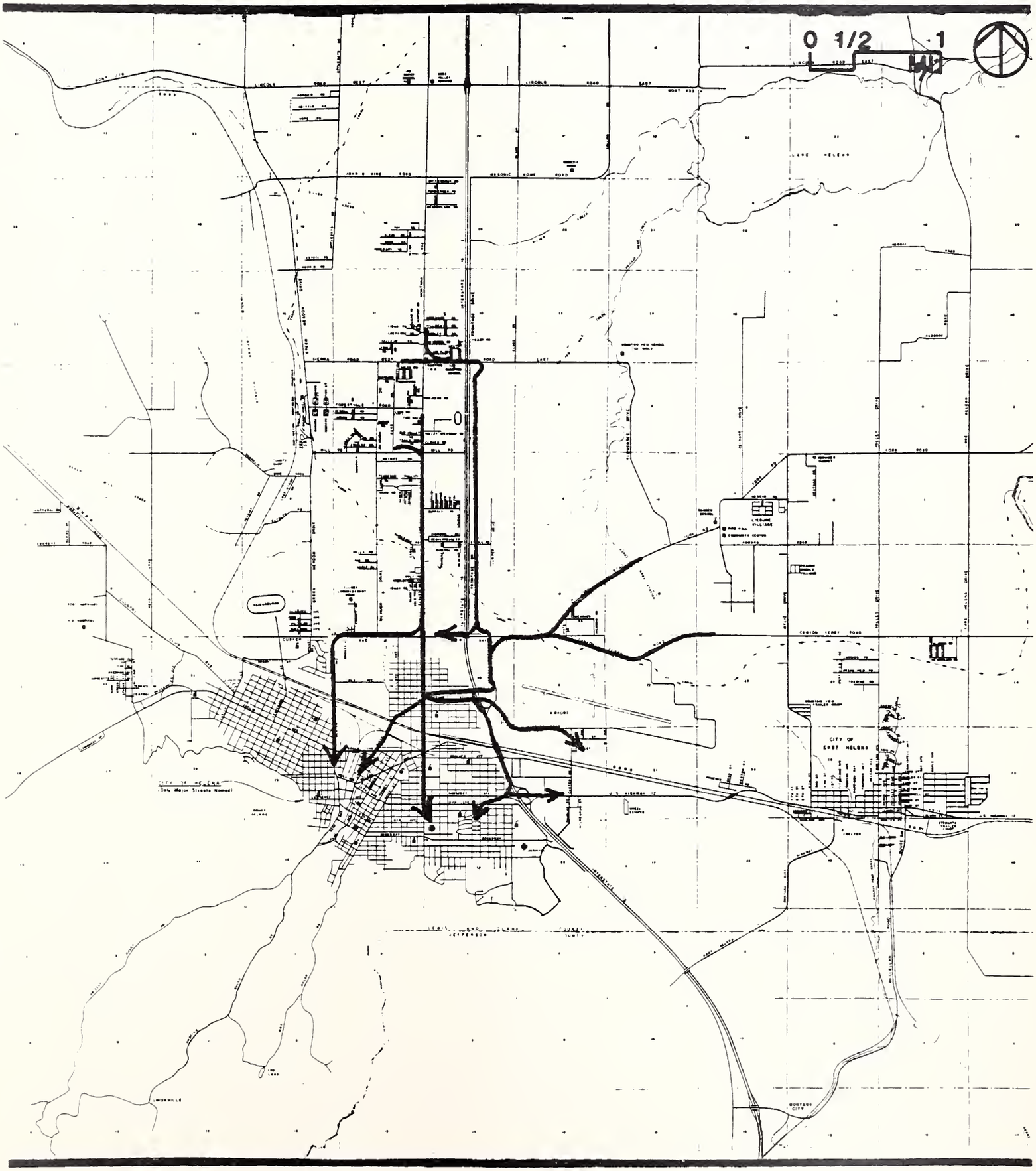
From areas south of Helena, the above mid-city destinations are reached via I-15 to the US 12 interchange, then west. Similarly, traffic from East Helena utilizes US 12 into Helena. To reach more northerly destinations, I-15 would be utilized north to Cedar Street. From this point, traffic would follow Cedar Street west or proceed north on Washington Street to eastbound Custer Avenue or northbound on the east frontage road to Sierra Drive.

A cursory review of Figures 3.11 and 3.12 suggests that improved access to and from I-15 would divert some traffic from immediately parallel roads like Washington Street and the east frontage drive. The diversion of traffic on Montana Avenue is dependent upon the number and location of points of improved interstate access. At the same time it must be remembered that this diverted traffic at some point must be routed from I-15 to surface arterials to ultimate destinations. The impact of this sort of shift should also be recognized.

legend

# APPROACH ROUTES FROM NORTH & NORTHWEST

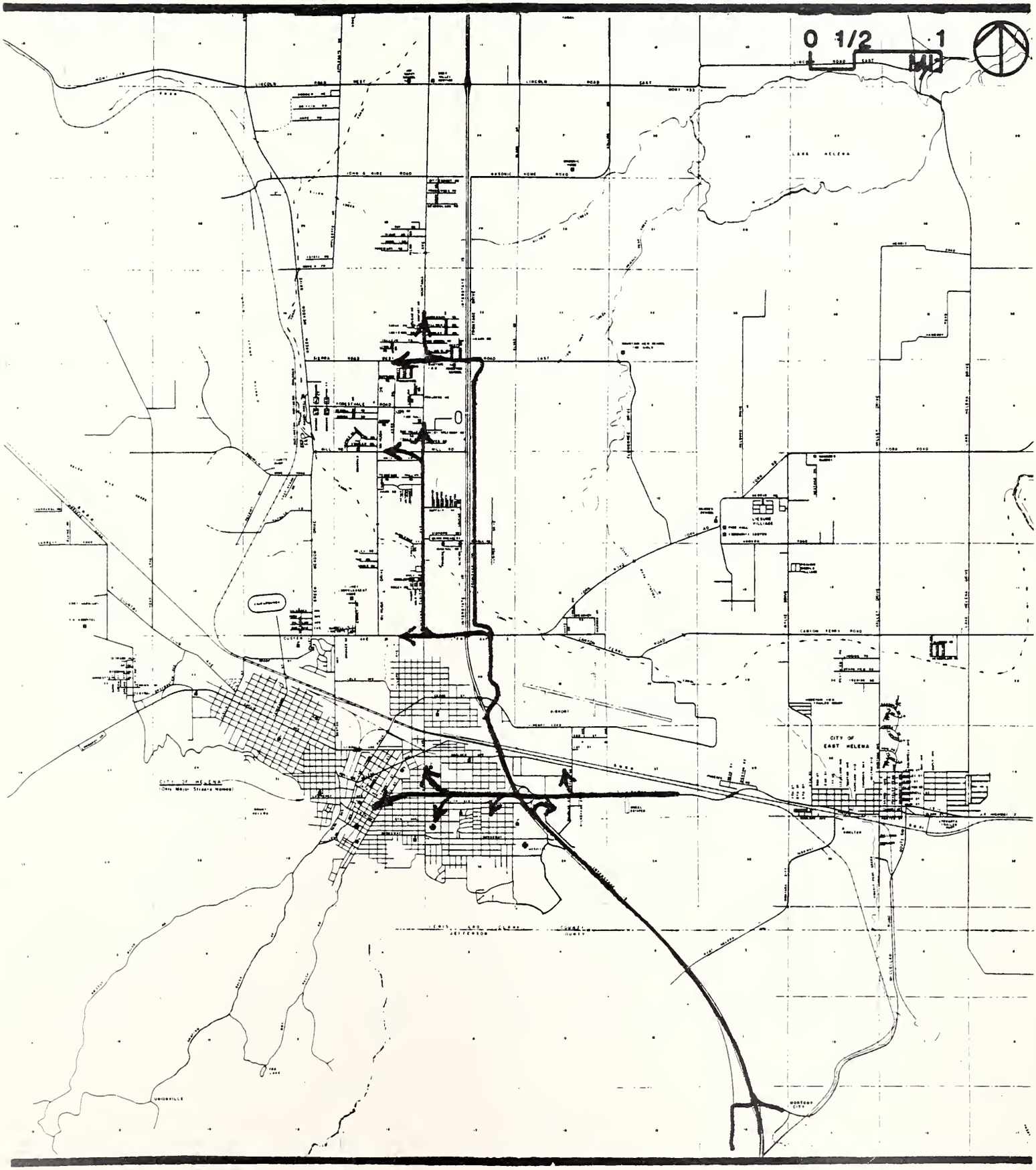
## figure 3.11



legend

# APPROACH ROUTES FROM SOUTH & EAST

figure 3.12



In the vicinity of the U.S. 12 interchange, a few observations may also be made. The U.S. 12 corridor serves as a trunk connector to outlying residential areas in the east valley. Moreover, west of I-15, 11th and Prospect Avenues serve as the principal feeder into central Helena. Fortunately the one-way couplet has considerable reserve capacity, but traffic problems are mainfesting themselves close to the interchange, in part because of development in the southeast sector. However, improved interstate access in the area south of U.S. 12 will have to be viewed in the context of the character of adjacent surface arterials and collectors to which the access improvements must necessarily relate.

## 3.4 FUTURE TRAFFIC PATTERNS

In order to help visualize how the travel patterns presented in Figures 3.6 to 3.10 sort themselves out on the street system, the traffic assignment of year 2000 travel to the existing plus committed street system was reviewed. As was discussed earlier, the patterns in which future traffic would utilize the street system are not unlike today's patterns, with the notable exception that future traffic levels would create intolerable capacity deficiencies along several streets.

An illustration of 1978 and 2000 traffic volumes on selected roadway segments is presented in Figures 3.13 and 3.14 and summarized in Table 3.4. All of the segments shown will experience significant increases in traffic levels. It should be noted that I-15 would continue to be utilized well under its capacity to move vehicles. Montana Avenue is approaching capacity from Custer Avenue southbound. Under future traffic volumes this point would move north to the vicinity of Mill Road.

## 3.5 IMPLICATIONS OF TRAVEL PATTERNS ON IMPROVED I-15 ACCESS

The preceding analyses have provided considerable insight into the relation between travel patterns in Helena and I-15. A few key conclusions should be noted at this point.

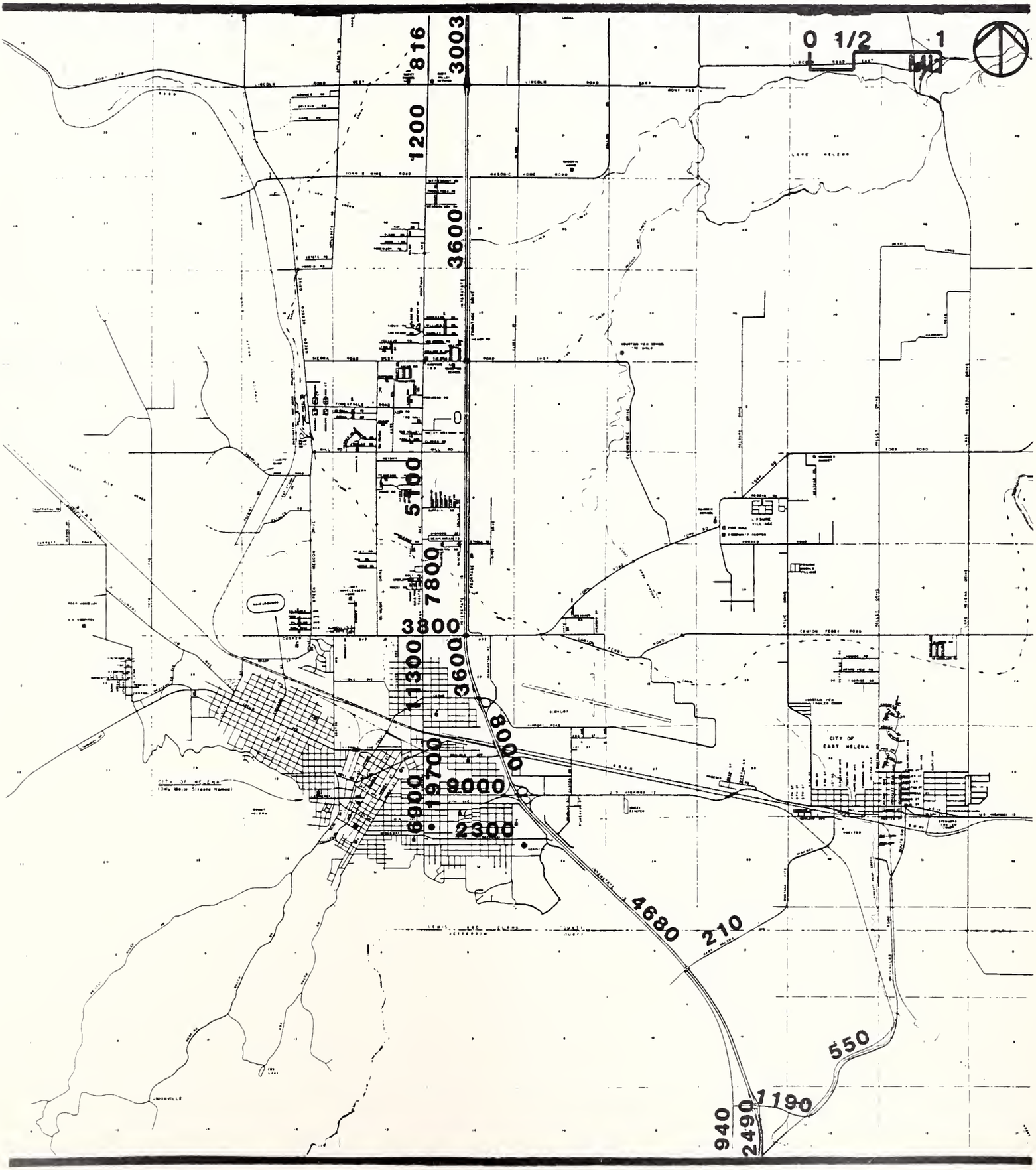
With respect to Montana Avenue, it is hoped that the improvement of access to I-15 in the proper configuration will reduce future volumes to those which can be serviced by the existing roadway cross section. A diversion strategy which does not satisfy this criteria, that is, does not reduce traffic volumes to 2-lane roadway levels, is unsatisfactory, at least from the standpoint of funding.

It is apparent then, for two parallel radial routes, that diversion of traffic from one to the other in an optimum fashion will require attention to the placement of diversionary access points. Also, if such a diversion is successful, its potentially negative impact on some other street should be recognized. Consideration might also be given to improvement of traffic service at existing I-15 access points where congestion presently exists. This action too will enhance the attractiveness of I-15.

Finally, between U.S. 12 and the Montana City interchange, provision of access directly to I-15 will be to a large degree dependent upon the fortunes of the Crossfire development since there are few roads and very little development in this area presently. Closer to Helena, of course, other factors present themselves for consideration.

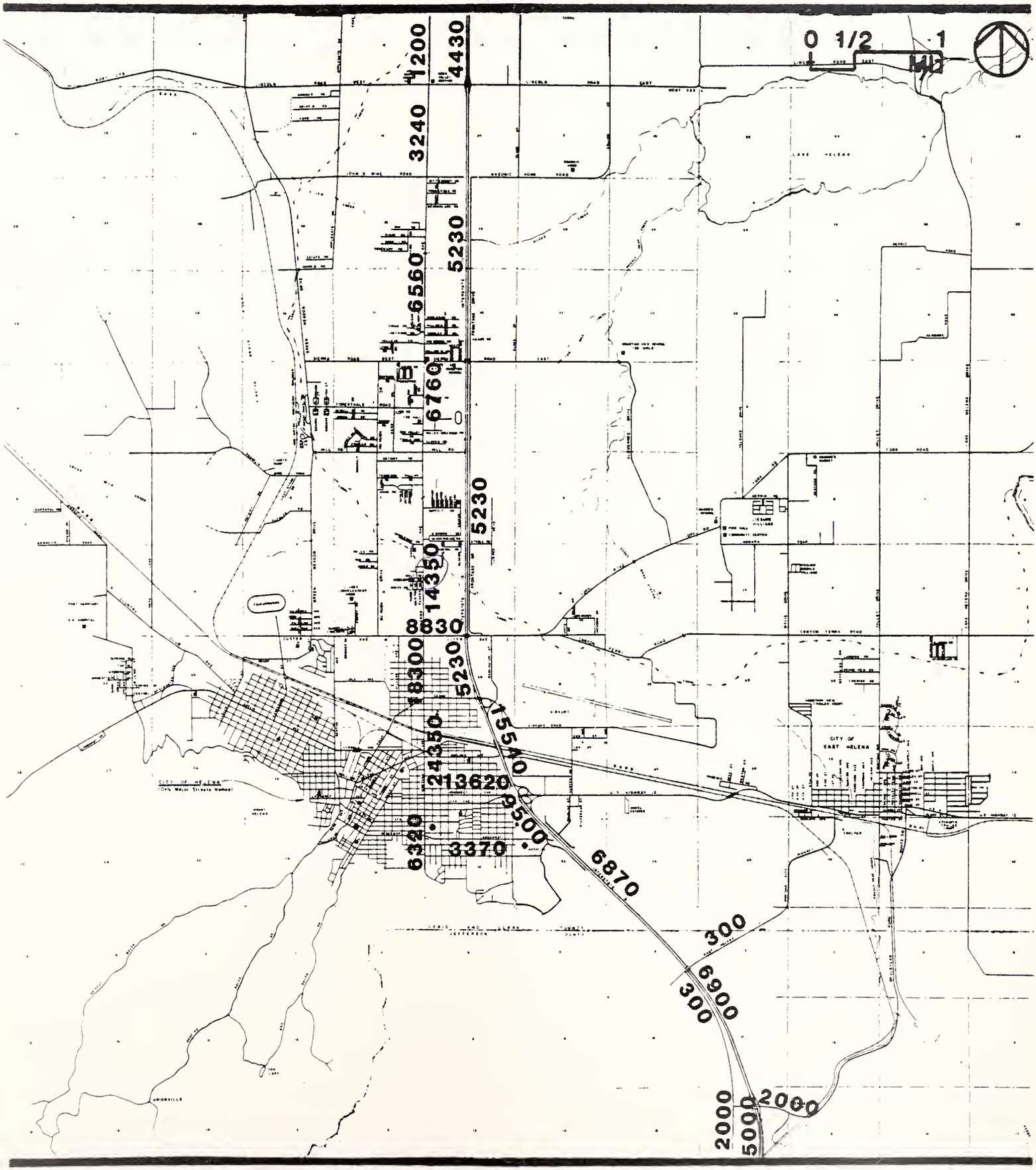
legend

# 1978 TRAFFIC VOLUMES
# E+C NETWORK
# figure 3.13



legend

# 2000 TRAFFIC VOLUMES
# E + C NETWORK
# figure 3.14



## TABLE 3.4
## TRAFFIC VOLUME COMPARISON

Daily volumes shown are for 1978 and for the year 2000 assignment to the Existing plus Committed (E+C) Street System.

| Street/Location | 1978 | 2000 | % Increase |
|---|---|---|---|
| Montana Avenue | | | |
| - S. of Mill Road | 5100 | 8600 | 69% |
| - N. of Custer Avenue | 7800 | 14530 | 86% |
| - N. of Cedar Street | 14000 11300 | 18300 | 30% |
| - N. of Prospect Avenue | 19700 | 24350 | 25% |
| I-15 | | | |
| - N. of Cedar Street | 3600 | 5230 | 45% |
| - US 12 to Cedar Street | 8000 | 15540 | 94% |
| - S. of US 12 | 4680 | 6870 | 48% |
| Custer Avenue | | | |
| - W. of Montana Avenue | 6400 | 11260 | 76% |
| - E. of Montana Avenue | 3800 | 6790 ? 8830 | 79% |
| Washington Street | 2900 | 11760 | 306% |
| Cedar Street | 11100 | 16720 | 51% |
| Prospect Avenue | | | |
| - W. of Lamborn Street | 9000 | 13620 | 51% |
| 11th Avenue | | | |
| - W. of Lamborn Street | 9200 | 12450 | 35% |
| US 12 | | | |
| - E. of I-15 | 10900 | 21270 | 95% |

# CHAPTER 4

# CORRIDOR ACCESS ALTERNATES

This Chapter describes potential and selected alternates for increasing access to I-15. It also presents the geometric layout and estimated cost of the selected improvement projects.

## 4.1 GENERAL OBJECTIVES AND CONSTRAINTS

This section describes potential improvement concepts which could be considered along I-15. It is useful to identify the range of projects which could be constructed rather than to approach the task with a preconceived notion that only 2 or 3 options are available. This approach will also permit the selection of several alternatives which would vary along the 12-mile section of I-15 being considered.

There are several objectives and constraints which must be kept in mind as options are developed, although these factors will probably have more influence in the grouping of potential improvements into the complete alternatives. These factors, illustrated in Figure 4.1, include:

- construction and ROW costs: extremely costly improvements would outweigh savings from not widening surface arterialis
- traffic diversion: adequate traffic diversion must be accomplished to warrant an improvement alternative
- barrier effect: alternatives should respond to the barrier problems posed by I-15
- traffic operations: proper spacing of interchanges and adequate weaving distances must be maintained
- environmental factors: alternatives should avoid significant adverse effects.

It is presently presumed that for planning purposes any new interchanges will provide for full access capabilities. Partial interchanges will not be considered. The geometric layout of each option conforms to accepted highway design practice.

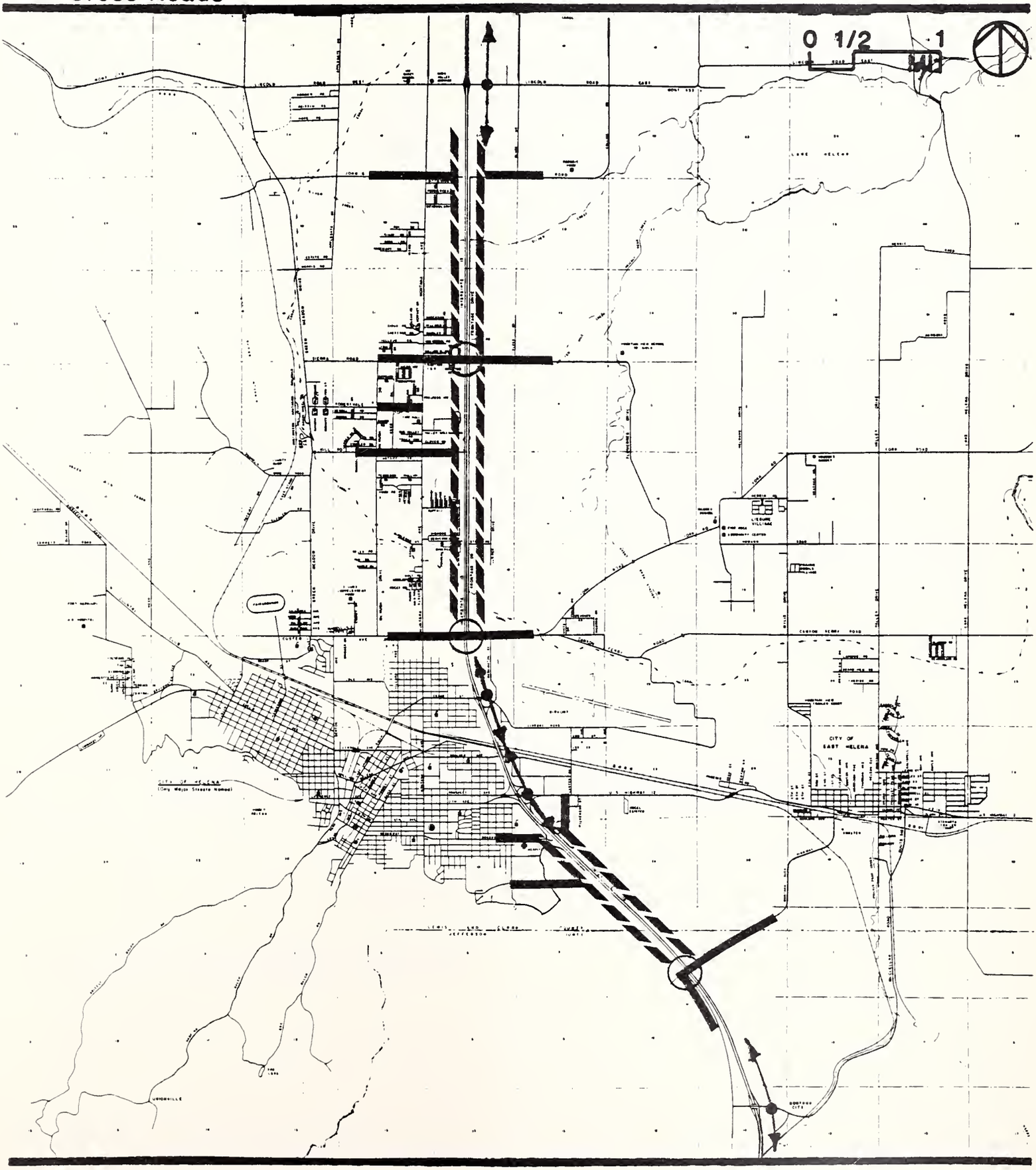
## 4.2 ROADWAY TYPICAL SECTIONS

The roadway typical sections assumed for new construction are shown in Figure 4.2. The interchange ramps (both entrance and exit) are 24 foot wide, which provides a 14 foot driving lane with a six foot outside shoulder and a four foot inside shoulder. Subgrade width is 47 feet which varies depending on the superelevation rate.

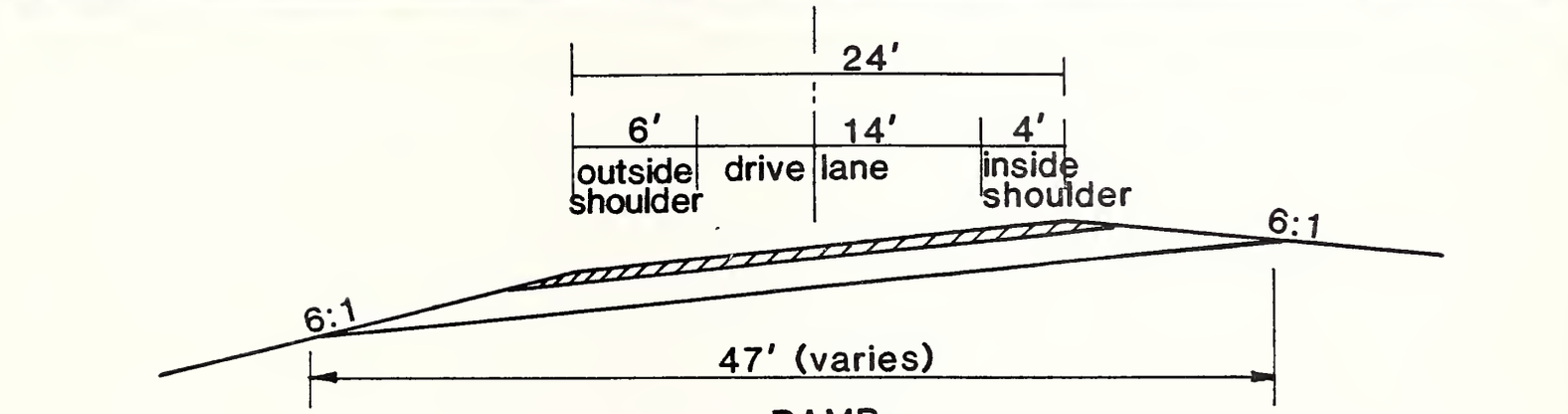
# ACCESS CONSTRAINTS
# figure 4.1

## legend

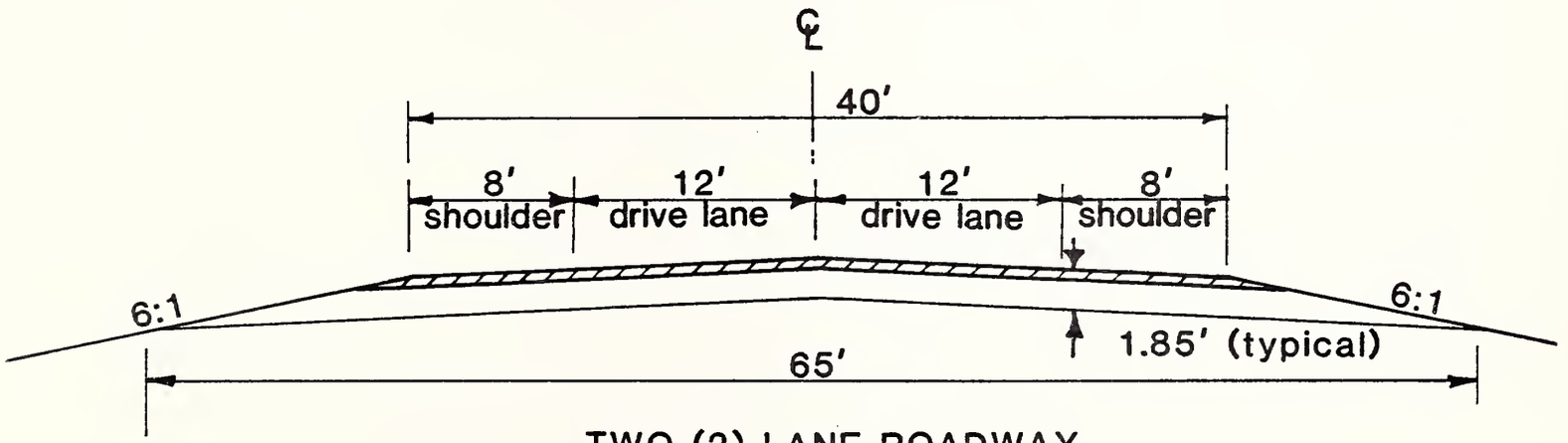
- Interchange Spacing
- Barrier Effects
- Grade Separation
- Cross Roads



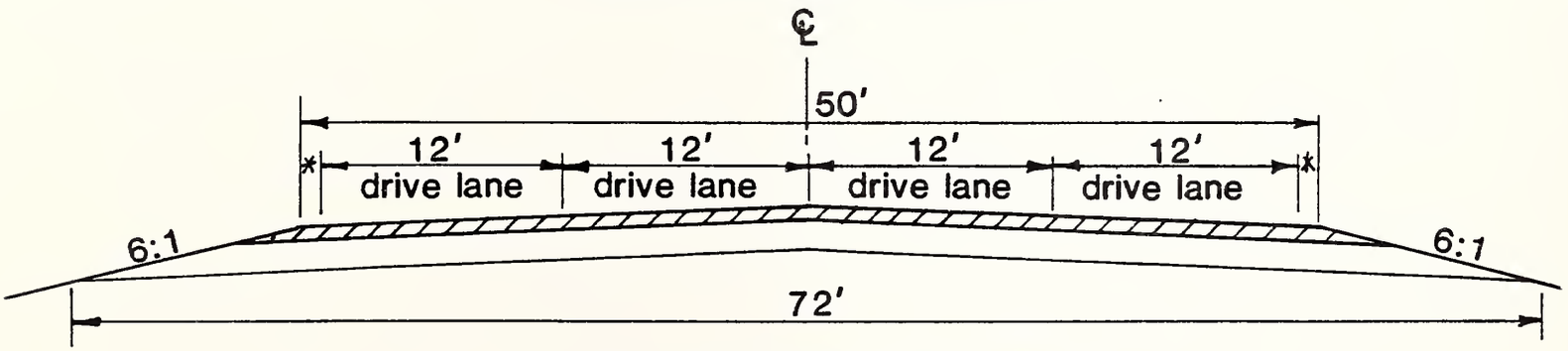
# ROADWAY TYPICAL SECTIONS
# figure 4.2




RAMP




TWO (2) LANE ROADWAY




FOUR (4) LANE ROADWAY

* MAY INCLUDE CURB & GUTTER

Two lane roadways are 40 feet wide, with 12 foot drive lanes and 8 foot shoulders. Subgrade width for a tangent section is 65 feet. Four lane roadways are 50 feet wide, with two 12 foot driving lanes in each direction. Curb and gutter may be provided for an urban section. Subgrade width for a tangent section is 72 feet. All typical sections assume a section depth of 1.85 feet, and 6 to 1 side slopes.

## 4.3 DESCRIPTION OF POTENTIAL IMPROVEMENTS

This section presents a variety of potential improvements along the I-15 corridor, moving from Lincoln Road south to the Montana City interchange.

John G. Mine Road/Masonic Home Road. Either a diamond interchange or a grade separation could be considered here. However, it is doubtful than any improvement is practical at this location because of the lack of development in the area.

Sierra Drive. The existing grade separation at this location could be upgraded to a diamond interchange or folded diamond interchange. The nursery on the northeast corner, the school on the southwest corner, and a residential area on the northwest corner could constrain the layout at this location. Sierra Drive is a collector road and has continuity to the east and west of I-15.

Forestvale Road. Forestvale Road could be extended east through private property to a diamond interchange or overpass at I-15. No road exists to the east on this alignment.

Mill Road. A diamond interchange or a simple grade separation to connect to the east frontage drive could be considered. Mill Road is designated as a collector street, and would serve as an intercept for the residential areas to its north. Right-of-way is presently undeveloped, but a bridge over I-15 and Tenmile Creek would be necessary, Mill Road would require upgrading, and the east frontage drive might require realignment. Adverse impacts would be limited to the section of Mill Road between Montana Avenue and I-15.

Custer Avenue. The consturction of an interchange could be considered because Custer is a minor arterial, and is a good east-west connecting street. Right-of-Way appears available and costs would be less because of the existing overpass. However, increased volumes could require another overpass. Adverse impacts would initially appear to be minimal as adjacent lands are undeveloped.

Broadway Avenue. An underpass for vehicular traffic could be considered at this location. As has been discussed in the past, an issue with this concept is the traffic impact to Broadway further to the west. The topography would lend itself well, but two structures would be required on I-15. Another option would be to construct only a pedestrian/bicycle tunnel. With a vehicular underpass, traffic shifts on southeast Helena streets would have to be considered. This location is close enough to the U.S. 12 Interchange that direct access, even through a folded or partial diamond would not be desirable.

Belt View Drive (extended). An interchange has been proposed at this location, and if warranted would lie about halfway between the U.S. 12 Interchange and the East Helena road overpass. Land in this area is undeveloped and environmental impacts would appear minimal.

East Helena Road. A diamond interchange could be considered at this location because of the advantageous topography, the existing overpass, and the undeveloped state of the property in the area. The Crossfire plan proposes maintaining the grade separation and construction a cloverleaf interchange to the north. For planning purposes, the exact location is not critical, and actual construction would depend on the extent of development in the immediate area.

West Frontage Road (East Helena Road to Beltview Drive). This linkage is proposed in the Crossfire plan and could contribute to improved distribution of traffic in southeast Helena, although its linkage to southeast Helena streets would have to be considered.

Subsequent review of these potential locations with TAC deleted consideration of options calling for addition of grade separations recause in most cases there would be little change in travel patterns and because the overpass is a major cost element of an interchange. An exception is the underpass at Broadway which is too close to U.S. 12 to permit access ramps to be constructed.

Of the preceding access options, it was decided that all but the northernmost were valid options for futher testing. Each of these potential projects are described in the following several sections. Figure 4.3 shows the location of each of the illustrative figures for each option.

## 4.4 SIERRA DRIVE INTERCHANGE

### 4.4.1 Description of Improvements - Concept A

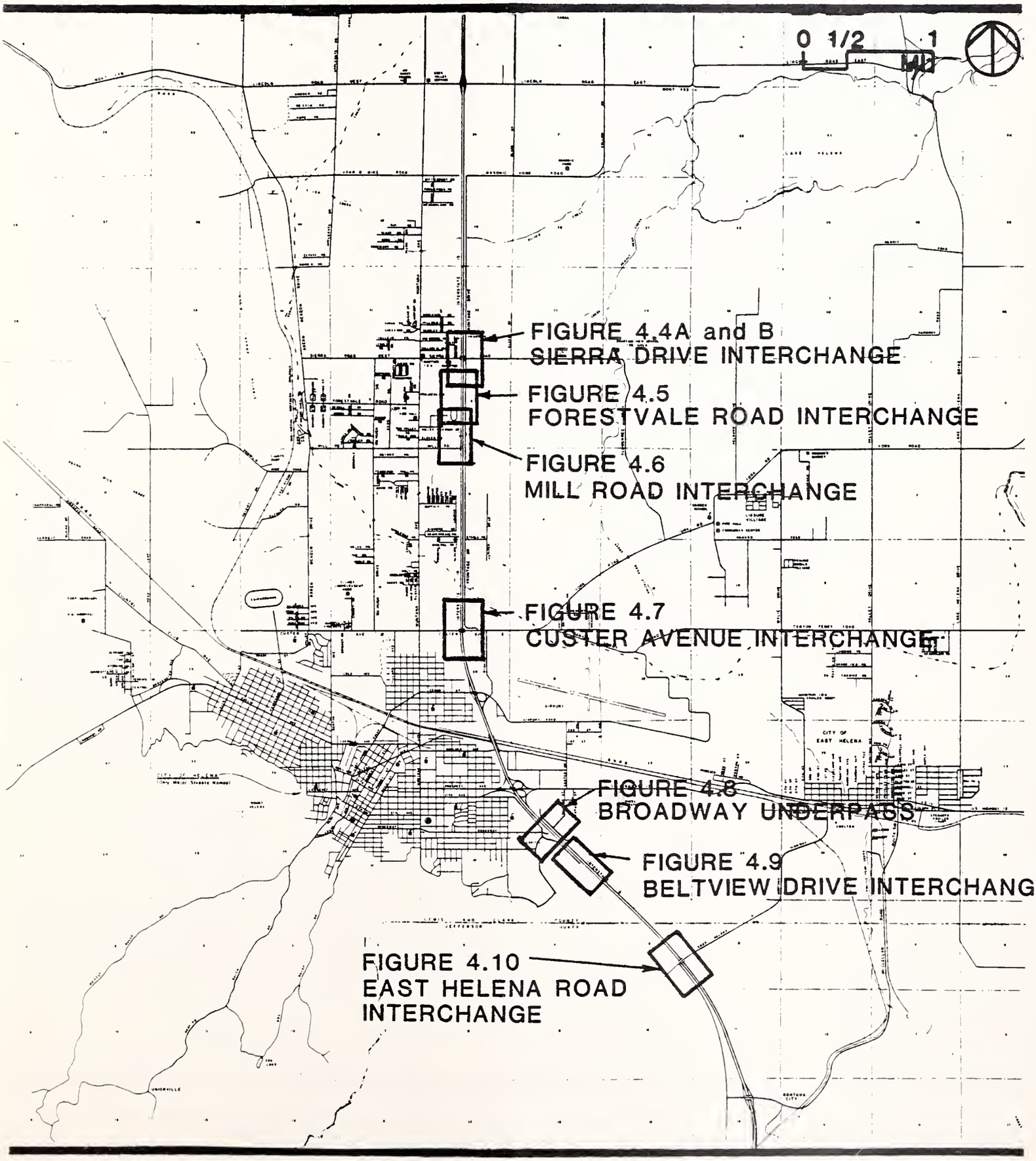
Basic Interchange Layout: Concept A for the Sierra Drive Interchange, as shown in Figure 4.4A, is a partial diamond interchange with full entrance anad exit ramps for south bound I-15, and entrance and exit slip ramps for north bound I-15. The slip ramps each intersect the east frontage road which provides access to Sierra Drive. This design utilizes the existing I-15 overpass structures and the ramps slope down from the overpass approaches to Sierra Drive. No new structures would be needed, but an 800 foot section of the frontage road would have to be realigned to accommodate the north bound exit ramp.

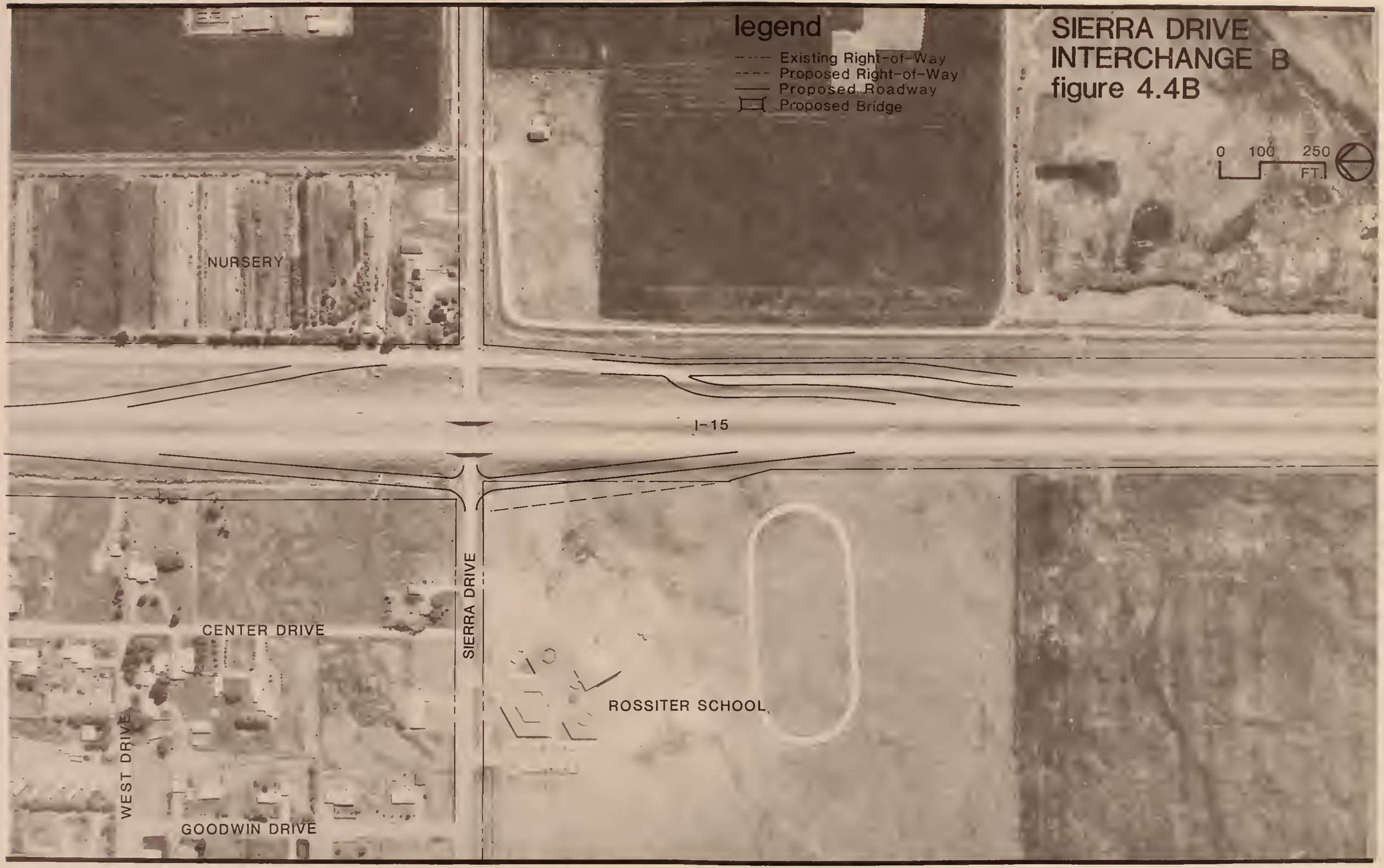
Separation between the ramp terminals on the west side of I-15 and the intersection of Sierra Drive with the east frontage road is minimal, however this allows the interchange to be located almost entirely within existing right-of-way. The south bound ramps were intentionally kept near the interstate to limit additional land acquisition, and the slip ramps preclude the need for extra right-of-way. The only new right-of-way required is in the southwest quadrant of the interchange where Rossiter School is located, and amounts to approximately 1/3 acre.

Integral Roads: Roadway improvements to the existing two-lane Sierra cross section would not be required, but traffic increases on Sierra Drive near Rossiter School would probably necessitate installation of a pedestrian-actuated crossing signal as shown on Figure 4.4.A.

legend

# IMPROVEMENT CONCEPTS KEY MAP figure 4.3




legend
Existing Right-of-Way
Proposed Right-of-Way
Proposed Roadway
Proposed Bridge
SIERRA DRIVE
INTERCHANGE B
figure 4.4B
0 100 250
FT.
NURSERY
CENTER DRIVE
SIERRA DRIVE
WEST DRIVE
GOODWIN DRIVE
ROSSITER SCHOOL

### 4.4.2 Estimated Costs

The following table summarizes estimated costs for design and construction of Concept A:

| | Interchange | Integral Roads | Total |
|---|---|---|---|
| Roadway | $173,440. | $ --- | $173,440. |
| Earthwork | 80,930. | --- | 80,930. |
| Misc. | --- | 20,000. | 20,000. |
| ROW | 14,520. | --- | 14,520. |
| | | Contingency | 27,440. |
| | | Engineering | 30,180. |
| | | Total | $346,510. |

### 4.4.3 Description of Improvements - Concept B

Basic Interchange Layout: The design concept shown in Figure 4.4B is an alternate for the Sierra Drive interchange. It is a hybrid design that incorporates diamond ramps for south bound I-15 and a loop ramp for north bound I-15. The north bound entrance and exit ramps are located in the southeast quadrant of the interchange which requires substantial realignment of the south leg of the east frontage road.

The majority of earthwork for this design would be used to construct the south bound entrance and exit ramps and the north bound loop ramp, which join the interstate on the overpass approaches. The north bound exit ramp and the frontage road realignment would require minimal earthwork quantities. Another construction aspect of Concept B is the installation of culverts in an irrigation ditch over which the north bound ramps and frontage road would pass. As in Concept A, the existing I-15 overpass structures would be used, and no new structures are needed.

Additional right-of-way is again limited to 1/3 acre in the southwest quadrant, where Rossiter School is located. In the southeast quadrant, approximately eight acres of additional land is needed to accommodate the north bound loop ramp. The ramp has been pulled back from Sierra Drive to provide an adequate acceleration lane without widening the existing I-15 bridge.

Integral Roads: As in Concept A, improvements to Sierra Drive are not necessary, but traffic increases near Rossiter School would probably require installation of a pedestrian-actuated crossing signal.

# SIERRA DRIVE INTERCHANGE A
figure 4.4A

legend
- Existing Right-of-Way
- Proposed Right-of-Way
- Proposed Roadway
- Proposed Bridge

0 100 250 FT.

NURSERY

EAST FRONTAGE ROAD

CENTER DRIVE

SIERRA DRIVE

WEST DRIVE

PEDESTRIAN ACTUATED CROSSING SIGNAL

GOODWIN DRIVE

ROSSITER SCHOOL

### 4.4.4 Estimated Costs

Costs for design and construction of Concept B are estimated at $539,720. Specific cost areas are summarized in the following table.

| | Interchange | Integral Roads | Total |
|---|---|---|---|
| Roadway | $295,950. | $ --- | $295,950. |
| Earthwork | 92,300. | --- | 92,300. |
| Misc. | 16,000. | 20,000. | 36,000. |
| ROW | 26,370. | --- | 26,370. |
| | | Contingency | 42,425. |
| | | Engineering | 46,675. |
| | | Total | $539,720. |

### 4.4.5 Alternatives Considered

In the development of Concepts A and B for the Sierra Drive interchange, several alternative designs were considered, among which was a full diamond interchange and a loop ramp for the entrance to south bound I-15. The diamond interchange was considered undesirable because of increased right-of-way requirements in the northeast quadrant. Construction of an entrance ramp there would have necessitated relocation of the frontage road and, therefore, acquisition of the nursery. The estimated cost of purchasing this property is such that slip ramps or a loop ramp in the southeast quadrant are more cost-effective.

A loop ramp entrance for south bound I-15 was considered as an alternative to acquiring right-of-way from Rossiter School, but was determined to be unworkable because of the proximity of housing development in the northwest quadrant. The available undeveloped area is not sufficient to accommodate a loop ramp similar to that shown in Figure 4.4B, and a ramp located closer to the overpass would not allow for an adequate acceleration lane without widening the existing bridge.

## 4.5 FORESTVALE ROAD INTERCHANGE

### 4.5.1 Description of Improvements

Basic Interchange Layout: A conceptual design for a Forestvale Road interchange is shown in Figure 4.5. The sketch plan shows a full diamond interchange with a new Forestvale overpass. The overpass requires an estimated 220 foot structure and the ramps slope down from the overpass approaches to I-15. Because the surrounding land is relatively flat, the proposed overpass would require substantial earthwork quantities, as would the north bound ramps, which intersect Forestvale near the overpass structure. The ramps are laid out with the intent of minimizing realignment of the frontage road while maintaining a desirable ramp terminal separation.

# FORESTVALE RD. INTERCHANGE
figure 4.5

legend
- Existing Right-of-Way
- Proposed Right-of-Way
- Proposed Roadway
- Proposed Bridge

0 100 250 FT.

EAST FRONTAGE ROAD

I-15

FORESTVALE ROAD (EXTENDED)

Additional right-of-way is required on both sides of I-15 for construction of the conceptual interchange. Approximately 3.5 acres east of the interstate and over six acres west of the interstate is necessary. Right-of-way trade-offs can be achieved by varying the ramp layout and, although land costs are generally higher west of I-15, there are no critical land uses near the interchange site that mandate substantial revision of the design or consideration of an alternate interchange type.

Integral Roads: Construction of a Forestvale interchange does require extension of Forestvale Road from its present terminus west of the Rod and Gun Club. To avoid splitting the Rod and Gun Club property, the Forestvale extension should be realigned south of the club buildings as shown on Figure 4-5.

### 4.5.2 Estimated Costs

The total estimated cost of the Forestvale Road interchange as shown is $1,445,310. The following table lists individual cost items.

| | Interchange | Integral Roads | Total |
|---|---|---|---|
| Roadway | $324,180 | $47,570 | $371,750 |
| Earthwork | 346,240 | 3,020 | 349,260 |
| Structures | 484,000 | --- | 484,000 |
| RQW | 24,140 | $20,000 | 44,140 |
| | | Contingency | 72,100 |
| | | Engineering | 124,060 |
| | | Total | $1,445,310 |

## 4.6 MILL ROAD INTERCHANGE

### 4.6.1 Description of Improvements

Basic Interchange Layout: The conceptual design developed for the Mill Road site is that of a partial diamond interchange with a northbound entrance loop ramp and a Mill Road overpass. The design is complicated by a new housing development east of I-15 and by Ten Mile Creek. To avoid impacting the development, the entire interchange is shifted over 600 feet north of a straight-line extension of Mill Road, and is designed with a special ramp layout to minimize the Ten Mile Creek crossings.

The only existing structures at this site are 50 foot bridges over Ten Mile Creek on the I-15 mainline and on the east frontage road. A new 370 foot overpass structure is shown for Mill Road. The bridge would span I-15, the east frontage road, and Ten Mile Creek. Two additional new structures are required for the southbound entrance ramp and the frontage road realignment. The northbound entrance ramp is designed to utilize the existing frontage road bridge and the southbound exit ramp is routed to avoid crossing the creek. Because the Mill Road site is predominantly flat, substantial earthwork quantities will be needed for the Mill Road overpass approaches and the ramps.

# MILL ROAD INTERCHANGE
figure 4.6

legend

- Existing Right-of-Way
- Proposed Right-of-Way
- Proposed Roadway
- Proposed Bridge

0 100 250 FT.

I-15

MILL ROAD (EXTENDED)

TO MONTANA AVENUE

TEN MILE CREEK

Additional right-of-way needed for construction of the conceptual design for Mill Road amounts to slightly over 19 acres. Land acquisition costs are not expected to vary a great deal near the interchange site as most of the property is open farm land.

Integral Roads: Construction of a Mill Road interchange necessitates an extension of Mill Road to the overpass as shown in Figure 4.6. Also, the existing length of Mill Road should be widened to match the 40 foot cross section of the extension. Additional right-of-way is required for both the extension and the widened existing Mill Road.

### 4.6.2 Estimated Costs

Design and construction costs for the Mill Road interchange are summarized in the following table.

| | Interchange | Integral Roads | Total |
|---|---|---|---|
| Roadway | $324,170 | $47,570 | $440,740 |
| Earthwork | 272,200 | 6,770 | 278,970 |
| Structures | 973,500 | --- | 973,500 |
| ROW | 29,030 | $20,000 | 68,480 |
| | | Contingency | 71,970 |
| | | Engineering | 176,530 |
| | | Total | $2,010,190 |

## 4.7 CUSTER AVENUE INTERCHANGE

### 4.7.1 Description of Improvements

Basic Interchange Layout: Figure 4.7 shows a potential design for an interchange at Custer Avenue. The design shown is that of a full diamond interchange which utilizes the existing Custer Avenue overpass. No additional structures are needed, and the only required earthwork would be for the interchange ramps. Another aspect of the conceptual design is provision for left turn bays on Custer at the ramp terminals. The location of the bays and bay tapers are shown by varying roadway widths along Custer Avenue.

An initial weaving analysis performed on this interchange design using transportation model traffic projections does not indicate a weaving problem between southbound vehicles entering I-15 at Custer and those exiting I-15 at Cedar, however a design with a southbound entrance loop ramp was studied as an alternative. A loop ramp located in the northwest quadrant of the interchange would provide more separation between the Custer on-ramp and the Cedar off-ramp, but the required acceleration lane would be difficult to accommodate beneath the existing Custer overpass. For that reason, a diamond interchange is the preferred concept.

# CUSTER AVENUE INTERCHANGE
figure 4.7

legend

- Existing Right-of-Way
- Proposed Right-of-Way
- Proposed Roadway
- Proposed Bridge

0 100 250 FT

I-15

CUSTER AVENUE

Additional right-of-way needed for construction of a Custer Avenue interchange is estimated at nine acres. The land surrounding the interchange site is farm land everywhere but in the northwest quadrant, where the proposed Frontier Mall Shopping Center is to be located.

Integral Roads: No improvements to the existing two-lane Custer roadway are required to provide access to the interchange, however, the effects of projected traffic loads on Custer are discussed in Chapter 5.

### 4.7.2 Estimated Costs

The following table lists the costs associated with design and construction of a Custer Avenue interchange.

| | Interchange | Integral Roads | Total |
|---|---|---|---|
| Roadway | $236,290 | --- | $236,290 |
| Earthwork | 194,470 | --- | 194,470 |
| ROW | 13,500 | --- | 13,500 |
| | | Contingency | 43,080 |
| | | Engineering | 47,380 |
| | | Total | 534,720 |

## 4.8 BROADWAY EXTENSION AND PEDESTRIAN OVERPASS

### 4.8.1 Description of Improvements - Broadway Extension

The Broadway extension from Colonial Drive to U.S. 12 is shown in Figure 4.8. The extension follows the alignment of an existing, unpaved road on the east side of I-15 and requires the construction of a Broadway underpass. To allow adequate clearance for the underpass without changing the vertical alignment of I-15, the Broadway approaches must be lowered below existing grade approximately 5 feet. This will necessitate reconstruction of the west Broadway approach approximately back to the intersection with Colonial Drive and of segments of the frontage road on the east side of I-15.

The twin I-15 overpass structures are to be approximately 130 feet long to accommodate a 40 foot Broadway cross section, sidewalks, and adequate sideslopes. In order to maintain interstate traffic during construction, the overpass structures must be stage-constructed with temporary traffic cross-overs.

Additional right-of-way necessary for construction of the Broadway extension consists of an 80 foot strip extending from the I-15 right-of-way line east and north to the Department of Highways access road. This land is property of the Department of Highways Department and would have to be acquired from that agency.

# BROADWAY EXTENSION & PEDESTRIAN OVERPASS

figure 4.8

## legend

- Existing Right-of-Way
- Proposed Right-of-Way
- Proposed Roadway
- Proposed Bridge

0 100 250 FT.

PEDESTRIAN OVERPASS

BROADWAY

WINNE

COLONIAL DRIVE

I-15

### 4.8.2 Estimated Costs - Broadway Extension

The total estimated cost for a Broadway extension is $958,910. Specific cost areas are listed below.

| | Underpass | Extension | Total |
|---|---|---|---|
| Roadway | $ 10,820 | $134,290 | $145,110 |
| Earthwork | 28,250 | 10,750 | 39,000 |
| Structures | 645,200 | --- | 645,200 |
| Misc. (Underpass Drainage, (I-15 Detour) | 48,750 | --- | 48,750 |
| ROW | --- | 3,720 | 3,720 |
| | | Contingency | 4,000 |
| | | Engineering | 73,130 |
| | | Total | $ 958,910 |

### 4.8.3 Description of Improvements - Pedestrian Overpass

The pedestrian overpass is not a part of the Broadway extension improvement, and is shown on Figure 4.8 only for convenience. The overpass would primarily serve people travelling to and from St. Peter's Hospital and Smith School on the west side of I-15, and the Department of Highways on the east side of I-15. It is located between two rises on opposite sides of the interstate and has a span of about 240 feet. No additional right-of-way is needed for construction of the overpass.

### 4.8.4 Estimated Costs - Pedestrian Overpass

Costs for the pedestrian overpass are summarized below.

| | |
|---|---|
| Structure | $150,000 |
| Engineering | 15,000 |
| Total | $165,000 |

## 4.9 BELTVIEW DRIVE INTERCHANGE

### 4.9.1 Description of Improvements

Basic Interchange Layout: The interchange design shown in Figure 4.9 for the Beltview Drive site is a full diamond with a Beltview overpass. The design requires construction of an overpass structure with a span length of approximately 220 feet and ramps which slope down from the overpass approaches to I-15. Despite the rises on either side of the interstate on which the overpass approaches are shown, substantial earthwork will be needed to construct the overpass and ramps.

# BELTVIEW DRIVE INTERCHANGE
figure 4.9

legend
- Existing Right-of-Way
- Proposed Right-of-Way
- Proposed Roadway
- Proposed Bridge

0 100 250 FT.

PRIVATE DRIVE

EAST FRONTAGE ROAD

← TO U.S. 12

I-15

COLONIAL DRIVE

Additional right-of-way is required for the interchange on both sides of I-15, with 5-6 acres needed on the east side and over eight acres on the west side. It is expected, however, that land west of I-15 will be donated by the developer of the area, and no cost has been estimated for it.

Integral Roads: Extension of Colonial Drive to the interchange is considered an integral part of the Beltview interchange concept. The extension would be a continuation of the 50 foot cross section used at the current terminus of Colonial Drive. Right-of-way is needed for the extension but again, it is anticipated that the land will be dedicated for the improvement. Also, part of the design is extension and improvement of the frontage road east of I-15 to the interchange. The frontage road, with an extension of Beltview Drive to I-15, would connect Beltview Drive to U.S. 12.

An extension of Beltview Drive and the continuation of Colonial Drive south of the interchange are shown on Figure 4.9, but would be constructed by the developer and are not considered part of the interchange improvements.

### 4.9.2 Estimated Costs

Estimated costs for a Beltview Drive interchange are shown in the following table.

| | Interchange | Integral Roads | Total |
|---|---|---|---|
| Roadway | $305,660 | $173,060 | $478.710 |
| Earthwork | 244,860 | 28,050 | 272,910 |
| Structures | 411,400 | --- | 411,400 |
| ROW | 8,505 | --- | 8,505 |
| | | Contingency | 75,160 |
| | | Engineering | 123,835 |
| | | Total | $1,370,520 |

## 4.10 EAST HELENA ROAD INTERCHANGE

### 4.10.1 Description of Improvements

Basic Interchange Layout: The design concept developed for East Helena Road is shown in Figure 4.10. The proposed design utilizes the existing East Helena Road overpass and no new structures are required. Topography at the East Helena site favors a diamond interchange and allows for a ramp layout that minimizes earthwork quantities. Some relocation of the west frontage road is necessitated by the southbound on-ramp, which makes partial use of the existing frontage road alignment.

Increased right-of-way is required to accommodate the northbound on and off ramps and the west frontage road. Approximate quantities of additional right-of-way are: seven acres east of I-15, and two and a half acres west of I-15.

# EAST HELENA RD. INTERCHANGE
figure 4.10

legend
- Existing Right-of-Way
- Proposed Right-of-Way
- Proposed Roadway
- Proposed Bridge

0 100 250 FT.

EAST HELENA RD

I-15

COLONIAL DRIVE (EXTENDED)

Integral Roads: In order for an East Helena interchange to serve the planned housing development along I-15, the west frontage road would have to be extended north from the proposed interchange to Colonial Drive. As mentioned in the design concept description for the Beltview interchange, the developer would assume the construction and right-of-way costs for part of the Colonial Drive - west frontage road extension; however, a cost has been estimated for the extension from the current boundary of platted development to East Helena Road.

### 4.10.2 Estimated Costs

The following table summarizes the estimated costs for an East Helena Road interchange.

| | Interchange | Integral Roads | Total |
|---|---|---|---|
| Roadway | $260,770 | $212,100 | $472,870 |
| Earthwork | 64,325 | --- | 64,325 |
| ROW | 9,520 | 8,950 | 18,720 |
| | | Contingency | 53,720 |
| | | Engineering | 59,075 |
| | | Total | $ 668,460 |

## 4.11 SELECTED ALTERNATES FOR TESTING

Based on discussions with the Technical Advisory Committee the following six alternate improvement packages were selected for testing with year 2000 traffic assignments. The Montana Department of Highways, Planning and Research Bureau performed the traffic assignments and provided them to HDR for comparison of the alternates.

Alternate 1 - Mill Road Interchange

Alternate 2 - Mill Road Interchange and Custer Avenue Interchange

Alternate 3 - East Helena Interchange and Broadway Underpass with Extension to U.S. 12.

Alternate 4 - Beltview Drive Interchange and Extension to U.S. 12

Alternate 5 - Mill Road Interchange, Custer Avenue Interchange, and Beltview Drive Interchange

Alternate 6 - Sierra Drive Interchange

From the set of access improvement options, it would be possible to define a variety of other alternates. However, time and resources do not permit unlimited testing. In the course of reviewing the preceding six alternates, it was determined that reasonable assessments of several other alternates can be accomplished by judicious comparison of the above alternates. Commentary on these other alternates is provided near the end of Chapter 5.

# CHAPTER 5

# EVALUATION OF ALTERNATES

In this chapter of the report the six basic alternates are evaluated and compared. In addition several other alternates for which traffic assignments were not specifically performed are also discussed.

## 5.1 EVALUATION PROCEDURES

The evaluation of alternative plans for any highway improvement is an involved process requiring the consideration of a host of social, economic, environmental and transportation related factors. This process becomes more complex when the alternatives being considered are not simply different geometric configurations at a single site, but rather entail the evaluation of alternative routes or, as is the case in this project, the evaluation of various schemes for improving access to a major transportation artery.

Means to evaluate and compare such transportation options can become equally complex. The optimum approach is one which points out significant differences between the alternates being considered and which is sufficiently detailed for that level of transportation planning. For this study it was determined that the evaluation procedure should:

- consider evaluation criteria which distinguish between the alternates.
- point out trade-offs between alternates.
- be systematic in its determination of the scope of impacts to the overall transportation system.
- permit an objective assessment of the advantages and disadvantages of the actions being considered.
- identify potential areas of significant impact from an environmental impact standpoint.
- permit presentation of evaluation factors in a clear and understandable fashion.

Several schemes for the comparison of alternatives exist. These include methods which consider only factors which can be quantified into dollars, and rating/ranking schemes which require some subjectivity in the specification of weights for evaluation criteria and the scores for individual alternatives against that criteria.

A brief review of the nature of the alternatives to be considered in this study shows that the extent of their direct impact on the physical environment is for the most part limited to the immediate vicinity of I-15. Moreover, of the broad set of evaluation factors which could be considered, it was determined that several specific factors profiled the most significant characteristics of each alternative.

On this basis an evaluation/comparison approach to assessing the alternates was adopted. First, a number of potential evaluation criteria are examined to determine whether a significant impact exists in that area and whether there are significant differences between the alternates with respect to that criteria. Next, each basic alternate is evaluated with respect to each significant criteria. Discussion of other possible alternate actions is also introduced. Finally, the criteria performance of each of the alternates is summarized in a series of tables. These comparison tables permit a side-by-side comparison of the alternate actions so that each reader can assess the relative importance of the trade-offs on an individual basis.

In this evaluation process, it should be emphasized that in the case of most evaluation criteria, the proposed alternates are compared to each other on the basis of what changes arise from that alternate relative to the Existing plus Committed System. For example, Alternate A may save $50,000 per year in highway user costs relative to the E+C System, while Alternate B may save only $20,000 per year in user costs relative to the E+C System.

## 5.2 EVALUATION CRITERIA

In this section a set of fourteen evaluation criteria are described. The general issues and means of calculation, if appropriate, for each criterion is presented. For eight of the factors the impacts of each alternate are minimal and do not distinguish between the options being considered. The latter five of the criteria provide significant insight into differences between the alternates and therefore are utilized later in this chapter to assess the merits of each individual alternate.

The evaluation factors considered are cultural resources, conservation and preservation, public facilities and services, displacement, air quality, aesthetics, traffic safety, transit/paratransit potentials, construction costs, vehicle user and travel time costs, construction costs of other system improvements, noise levels, traffic diversion and community impacts.

### 5.2.1 Cultural Resources

There are no known cultural, historical or archaeological resources at any of the potential interchange or improvement areas. Consequently, no adverse impacts are anticipated. An environmental document on any project to be implemented would research this subject in greater detail. In addition, a cultural resources survey is generally performed prior to any highway construction. Should archaeological artifacts not identified by the survey be discovered during construction, construction work would be temporarily suspended and a more extensive resources survey undertaken. No differences among the alternates exist with regard to this factor, nor are the impacts anticipated to be of consequence.

### 5.2.2 Conservation and Preservation

The corridor study area can generally be described as broken pasture - rangelands interspersed with medium density suburban development. As a result of the suburbanization in the corridor area, the habitat area can be considered as essentially a suburban environment. Construction activities associated with any potential interchange or improvement area would not significantly disrupt any major ecological habitat type.

The impact of suburban growth in the corridor area has limited the types of wildlife and waterfowl to those that can form compatible associations with moderate human activity. The animals which have made this adjustment include some songbird species and duck species, and smaller mammals and rodents. Larger mammals such as deer and coyotes are not compatible, although some occasional individuals will enter, or live in, the corridor area from time to time.

The amount of land that will be disturbed during construction activities varies for each alternate or improvement package. There are no unusual vegetation features that will be disrupted by any of the potential improvements. There are some larger decidious trees located along Ten Mile Creek which would be taken for ramp and roadways with Alternate 3 - Mill Road Interchange, but these trees are not considered unique or unusual.

As with all construction activities, there exists the potential for some soil erosion and sedimentation. All ramp and roadway sideslopes and backslopes would be topsoiled and revegetated. Temporary erosion control measures as necessary would be utilized while the vegetation establishes itself. Sedimentation or detention ponds would be utilized as required during grading and embankment operations. Surface and ground water will not be adversely affected by construction of any of the improvements. Drainage patterns and flows will be perpetuated as necessary. It has been assumed that the course of Ten Mile Creek will not be altered, and that bridges will be used for the creek crossings necessary in the Mill Road interchange alternate.

With respect to the preceding discussion, no significant difference between alternates was noted. The costs of maintaining existing natural drainage ways is included in the capital cost of each alternate.

There are no designated parks or recreation areas which would be impacted by any of the alternates. However, a minimal amount of right-of-way (0.33 acres) would be required along the east side of the Rossiter School area located on Sierra Drive for a southbound ramp onto I-15 for Alternate 6 - Sierra Drive Interchange. a determination of the status of this site with regard to its use as a publicly-owned park or recreational area may be necessary under the provisions of the FHWA's Section 4(J) requirements.

Also, as is discussed later in this chapter, the need may arise to attenuate vehicular noise from I-15 and the southbound on-ramp of Alternate 6 - Sierra Road Interchange. One solution to this, should projected noise levels exceed standards, would be a raised earthen berm which may require a small amount of additional right-of-way.

### 5.2.3 Public Facilities and Services

Construction of any of the interchanges will increase accessibility to religious, health and educational facilities. Fire protection and other emergency services will benefit by the faster travel times provided by any of the potential interchanges. Those alternates which enhance access to I-15 to a greater degree would in this regard provide greater benefits to the community. However, the difference in this factor between the alternates is not considered to be significant.

There may be some disruptions of utility services during relocation of utilities necessitated by construction of any of the alternates. These disruptions should be minimal in scope and impact.

Construction of any of the alternates will involve intermittent or short interruptions to traffic at spot locations. Careful scheduling of construction activities will minimize these disruptions. Attention will also be necessary in the routing and hours of operation of heavy trucks and construction equipment regarding the maintaining of reasonably good traffic flow and safety on adjoining surface streets. This factor is not considered to be significant in the evaluation of the alternatives.

### 5.2.4 Displacement

No displacement of residences, businesses or farms is anticipated for any of the alternates. Although right-of-way will be required from existing residential or other private properties for the extensions of Mill Road and Forestvale Road to Montana Avenue, no homes will be taken or relocated. The nursery located in the northwest quadrant of the Sierra Drive interchange is not impacted by the improvements as currently depicted. Should changes to the interchange configuration be desired (such as ramp location), the nursery may be affected.

The need to acquire right-of-way varies with the alternates but does not entail the purchase of any dwelling units or businesses. These costs are reflected in the improvement cost estimates for each alternate.

### 5.2.5 Air Quality

Air pollutant emissions from vehicular traffic can be expected to decrease with the implementation of any of the interchange alternates. Traffic is removed from the surface arterials to the interstate, promoting smoother traffic flow and reduced congestion at intersections. Additionally, all alternatives considered reduce the number of vehicle hours traveled below that of the E+C network, with a corresponding reduction in vehicle air pollutant emissions. Vehicle air pollutant emissions can also be expected to decrease as fuel efficiencies increase and automobile emission standards become more stringent.

Construction activities would cause a temporary increase in pollutant emissions in the immediate construction areas, with a corresponding degredation of the ambient air quality in each area. The primary pollutant would be fugitive dust. Fugitive dust emissions could be reduced by adequate watering of construction areas and proper maintenance and handling of construction equipment would aid in reducing all pollutant emissions.

While some alternates are more effective than others in promoting the use of I-15, reducing arterial traffic volumes, and dispersing traffic, air quality on an area-wide basis is not expected to vary widely between the alternates.

### 5.2.6 Aesthetics

Aesthetics involve making the "view of the road" and the "view from the road" visually pleasant and/or appealing. This goal translates into concepts that maximize the use of natural grasses, shrubs, or other vegetation, and that maximize the use of pleasing surface treatments, shapes and forms to create a visually pleasant environment.

Good aesthetic concepts can create a positive psychological effect by reducing public awareness of the highway project. In addition, good aesthetic concepts can create positive physiological effects such as use of plantings and vegetation to help in the attenuation of vehicular noise emissions.

All roadways and interchange areas can be integrated with the existing suburban form by utilizing natural grasses and shrubbery in open areas and shrubs or trees as appropriate along right-of-way fences and boundary lines. Embankments can be enhanced by the use of variable contouring and suitable ground cover.

Tree and shrubbery plantings could be considered along the entire study corridor both to enhance the first impression of visitors to the Capital City, to improve the visual experience for local travellers on I-15, and to help screen the highway from existing residential and related land uses.

None of the alternates specifically requires landscaping and related treatments, although they may present opportunities for such actions.

### 5.2.7 Traffic Safety Considerations

An aspect to be considered in the diversion of traffic from surface arterials to I-15 is that of traffic safety. It is generally known that well-designed interstate highways experience an accident rate, and consequently user accident costs, which are considerably less than those for surface arterial streets.

No readily available local data on current accident frequency per million vehicle miles (MVM) of travel exists. The 1970 HUTS Transportation Plan indicated that all principal roads in this study area had rates of less than 16 accidents per MVM, but did not distinguish any rates below this level. A brief analysis of the City of Helena's accident experience for 1978 indicates that Montana Avenue between Custer Avenue and 11th Avenue had in that year a gross accident experience rate of about 7 accidents per MVM. This approximate figure is above the average rate for urban arterial streets.

Several recent studies indicate that accident rates on any given class of street tend to increase with increasing traffic volumes. For a 4-lane divided highway with access control, average rates range from 0.6 accidents per MVM at 2,000 vehicles per day to 1.1 accidents per MVM for 20,000 vehicles per day. This range of traffic is representative of the existing and forecast volumes on I-15. While this is

a large percentage increase the absolute value is still low. Moreover, the greatest difference between the highest levels of traffic on I-15 in the year 2000 on the Existing Plus Committed Network versus any of the proposed alternates is about 4,000 vehicles daily. The incremental impact of this difference in traffic levels would be only about 0.1 accidents per MVM.

It is true that many of the forecast trips on I-15 will be commuter trips to and from work. However, the highest forecast volume will not degrade traffic service beyond level of service C. In addition, the action over which the higher volumes (say 10,000 vehicles per day) will occur on only a relatively short portion of I-15. Consequently, it is concluded that the projected level of traffic volumes will not contribute inordinately or extraordinarily to the accident rate which would be normally associated with that level of traffic.

Attraction of traffic from the arterial streets to I-15 thus provide a dual benefit of reducing arterial traffic and thus the accident experience on those streets, and transferring that traffic to a roadway with considerably lower accident potentials. Accident rates for undivided surface roads range from 2.50 accidents per MVM in rural areas to an average of 5 to 6 in urban areas with heavily commercialized streets at higher rates.

The cost of accidents to the vehicle operator was incorporated into the cost analyses performed for the various alternative. The costs used are considered to be conservative in terms of real costs, but are representative ofthe fact that higher speed roadways are either of higher design quality and thus safer or are lower volume roadways with lower accident exposure. This cost of accidents is incorporated into the user's cost analysis explained in this chapter.

The addition of some short trips to the I-15 facility might be expected to contribute slightly to the accident rate because of the greater member of merge and weaving maneuvers. This effect would be greatest for those alternates involving the greatest number of interchanges. However, this is mitigated by the fact that the absolute level of traffic on I-15 in the year 2000 persists for a relatively short distance and is far from the capacity of the facility.

### 5.2.8 Transit and Paratransit Potentials

Considerable attention in recent years has been focused on increasing transit ridership and private vehicle occupancy. In many cases transit has made significant contributions to lessening peak period congestion and increasing the efficiency of the transportation system to move people from one place to another.

Unfortunately, this is usually not the case in smaller urban areas. Public transit requires public subsidy and more often than not, the subsidy is insufficient to support transit at the level necessary to compete with the auto. Moreover, the size and density of cities near the 50,000 population level are not great enough to generate adequate numbers of transit patrons.

An approach which is more readily feasible and practical in cities of this size is the support and encouragement of what are collectively labelled as paratransit strategies. These include demand-responsive service, van pooling, car pooling and ride sharing. Currently, the City of Helena operates several Dial-A-Ride buses, but this service focuses on the transportation disadvantaged and is on a fairly small scale.

The Montana Department of Highways presently operates three vans, each making two circuits. collectively, this amounts to 72 patrons, 14% of all employees. Riders pay $20 monthly with the Department absorbing some related costs. The success of this effort has prompted consideration of expanding the program at the Departments, and initiating it at the Capital complex. About half of Department employees presently walk, bicycle, car pool, or van pool to work. It must be presumed that the primary incentive for this commendable level of participation to non-vehicular or higher occupancy travel modes lies in the costs of commuting because of higher gasoline and auto ownership costs.

Not all work trips are conducive to such ridersharing efforts. Generally, they work best at larger places of employment where there is greater liklihood of matching work hours and location of residences. There is a benefit to the community through slightly lower peak period volumes and less vehicle emissions, but the primary gain is to the individual.

For example, if one-third of those driving to work in Helena in 1978 "doubled up" with someone else, trips in the peak period would be reduced by about 2000 trips. The impact of this on traffic service would depend on the concentration and orientation of these carpoolers, but this would amount to about 15% of all peak-hour trips. Expecting one out of three persons to do so is optimistic at this point in time.

With respect to this study of improved access to I-15, the prospect of contributing to ridesharing should be considered. Because of the orientation of I-15 to existing and planned land uses, it isdifficult to envision a major role for I-15 in this regard particularly in terms of work trips made within the urban area. A brief review of Figures 3.1 and 3.6 suggest that improved access to I-15 will shorten the travel time for some work trips, and may facilitate some ridesharing connections. Any direct linkage of significance between increased ridesharing and improved I-15 access is not readily apparent.

In terms of traffic coming into Helena from surrounding areas, the prospects realistically do not seem much greater. The notion of park-and-ride lots wherein drivers would meet at fringe locations and then carpool to some place of employment in the city does not appear feasible because the scale of distances involved is too short. Most of Helena's employment is within two miles of an I-15 interchange, and after a five to fifteen mile commute to Helena, another mile or two is not significant. More likely, commuters would meet at a more remote location and pool to Helena.

Certainly, improved access to I-15 would enhance the flexibiiity of travel patterns and may facilitate some ridesharing activity indirectly. However because of the spatial distribution of land uses and travel patterns and the other factors discussed, there is not considered to be a significant difference between the alternatives in terms of transit and paratransit potentials.

### 5.2.9 Community Impacts

This evaluation criteria is intended to encompass two factors relating to the general urban area. The first is a discussion of the barrier effect and the second is land use impacts.

The Barrier Effect. This refers to physical man-made barrier created when I-15 was constructed. Since that time Helena has grown considerably and development has pushed east to I-15 and in some areas begun on the east side.

From Lincoln Road, the next crossing south on I-15 is the Sierra Drive grade separation. Another three miles south is the Custer Drive overpass. The Cedar Street and U.S. 12 interchanges and the Boulder Drive grade separation lie within the next two miles. South of U.S. 12, 2.5 miles is East Helena Road. The Montana City interchange is another 1.5 miles to the south.

The barrier effect presents itself when there is restricted cross-access, and a demand to cross I-15 which cannot be diverted to the nearest interchange or grade separation. Based on these criteria, the portion of the study area of major interest would lie between Sierra Drive and Custer Avenue, and between U.S. 12 and East Helena Road.

For vehicular or bicycle trips, the barrier effect creates inconvenience and extra travel distance, but really only for linkages more or less opposite each other with respect to the barrier. For pedestrians, the barrier creates a temptation to cross the interstate highway on foot -- a dangerous maneuver.

Between Sierra Drive and Custer Avenue, there is presently little developed land use on the east side of I-15 and the land use projection for this area foresees only a very modest portion of new growth in this area, principally residential in nature. On the west side of I-15 in this section, land uses near I-15 will be principally residential. The residential-to-residential trip linkage should not create heavy cross travel demands since each area will have its own neighborhood identity. The nearest school is located at the Sierra Drive grade separation. Either the Forestvale Drive or Mill Road interchanges would significantly lessen the barrier effect in this section.

South of U.S. 12, a different situation presents itself. On the east side of U.S. 12 there are some residences and a major employment center, the Department of Highways. On the west side is considerable residential development and a grade school. Linkages are known to exist between the employment and the residences on the west and between the school and the residences to the east. This is compounded by the fact that the U.S. 12 overpass at I-15 cannot safely accommodate non-vehicular traffic because of the bridge widths and the ramp traffic movements. This condition restricts both pedestrian travel and bicyclists who use the bike path on the north side of U.S. 12 and extending east to East Helena.

Options to remedy this situation are few. Modifications to the U.S. 12 interchange with I-15 would be difficult and costly. The Broadway underpass discussed in conjunction with the East Helena Road interchange would provide a reasonably direct grade separation for these linkages. The proposed Beltview interchange would be convenient although some bicyclers and pedestrians might use it.

Another option would be a pedestrian overpass as conceptually suggested earlier on Figure 4.8. An underpass could be considered in the vicinity of Broadway, but would be more costly and less safe. The pedestrian overpass option is not structured into any of the interchange alternates, but may deserve consideration in the event the Broadway underpass is not constructed. Besides serving pedestrian needs, it could function as a logical extension of the East Helena bikeway.

Land Use Impacts. Transportation facilities and land use patterns interact with each other in response to various public policies, natural geography, and other constraints, to shape our urban areas. The linkage between the two is strong enough in many cases that current federal policies are stressing the review of land use changes as a result of transportation improvements, when evaluating alternatives or preparing Environmental Impact Statements. A recent Executive Order from the President permits municipalities to request an Urban Impact Analysis when a proposed Federally-funded project (highway, sewer, etc.) is anticipated to significantly diminish or threaten the vitality of the city center.

The literature can provide a number of studies which address the general issues associated with the effect on highway impacts on land use. In the context of the Helena area setting, some observations regarding potential I-15 improvements can be made with respect to the anticipated land use projections discussed in Chapter 2.

In the absence of improved access to I-15, the land use allocations for the transportation plan update call for increases in population, employment, and commercial space in the strip of land along the west side of I-15. The principal areas of residential and commercial potential are today being planned and in some cases committed for development. If access to I-15 is not improved, then it is reasonable to assume that future transportation improvement projects would solve capacity problems on arterial streets, thus providing reasonable access to these land uses.

Additional interchanges would increase local and regional accessibility to some land areas, possibly influencing property values on strategically located parcels of land, and could have some influence on the location of employment and commercial facilities, particularly those which are highway-related. However, basic urban land use economics provide a damper on excessive speculation. For example, commercial development is minimal or non-existent at the Lincoln Road and Montana City interchanges because of the lack of traffic exposure and surrounding trade area.

Increased accessibility to I-15 will enhance the ease or convenience to land uses in and near these new access points, possibly reinforcing the anticipated development patterns. However, the order of magnitude of Helena's growth in thenext 20 years and the distribution of that growth in the socio-demographic allocations suggest that the impact of new I-15 interchanges on land use patterns may influence the distribution of certain land uses, particularly retail services, within a specific district, but should not prompt wholesale redistribution and major shifts in land uses from those envisioned. Local governmental policies regarding utility services, zoning, building permits and subdivision codes are equally important in influencing the shape and four of urban land use patterns.

In summary, it is concluded that the I-15 interchanges might influence the distribution of some land uses, particularly retail services within specific zones, but is not anticipated to cause drastic deviations from the land use patterns represented by the socio-demographic projections for the area, relative to the likelihood that surface arterials would be improved in the absence of improved I-15 access.

### 5.2.10 Noise

In recent years, there has been an increasing awareness of noise in general and traffic-generated noise in particular. This increased perception has prompted efforts to study and respond to the traffic noise problem. One of the considerations of this study, therefore, is to identify any locations where significant noise impacts might occur due to increased access to I-15 and the resulting traffic diversions.

Increasing traffic-related noise is to be expected in the Helena area because of normal traffic growth on the E+C network. This projected growth will undoubtedly result in some noise problem areas where traffic increases are especially heavy. Diversion of traffic to I-15 via new interchanges, while decreasing noise on some routes, will generate perceptably more noise along those street segments used to access the proposed interchange sites.

Most of the streets that would carry traffic to and from the proposed interchange locations are currently surrounded by undeveloped land where permmissible noise levels would accommodate increased traffic. The interchange connectors in this category are; East Helena Road, Custer Avenue and extended versions of Beltview Drive, Broadway Avenue, Forestvale Road and Colonial Drive.

The remaining streets that serve proposed interchange locations are Sierra Drive and Mill Road. Both of these streets are bordered by residential development between Montana Avenue and I-15 with the potential for adverse noise impacts. In addition, Rossiter School is located on Sierra near the terminus of a proposed interchange ramp.

To determine the noise levels that might be experienced at these locations if an interchange was constructed, a preliminary noise analysis was conducted. The analysis was performed using assigned year 2000 daily volumes with an assumed peak hour volume equal to ten percent of the daily volume. A distance to observer was taken as the distance from the roadway center line to the nearest right-of-way line. Predicted noise levels ($L_{10}$) were computed for the maximum traffic assigned under one of the six alternates and for the projected E+C traffic without any improvements. A separate noise level was calculated for the impact of I-15 traffic on Rossiter School assuming the addition of a Sierra Drive interchange.

The maximum noise level at the right-of-way along Mill Road under alternates 2 and 5 is estimated at 71 dBA which slightly exceeds the design noise level for residential areas(70 dBA). Because Mill Road does not currently extend east to I-15, no projected volumes are available for the E+C network without a Mill Road interchange and, therefore, no comparison is possible.

With the construction of a Sierra Drive interchange, predicted noise levels at the right-of-way line along Sierra (between Montana Avenue and I-15) are approximately 67 dBA, which is below the design noise level for residential areas. This noise level compares to 64 dBA along Sierra for year 2000 traffic on the E+C network.

The noise impact on Rossiter School caused by I-15 was determined for a point along the proposed right-of-way line which parallels the southbound I-15 entrance ramp. This noise level is a composite of noise produced by north and southbound traffic on I-15 and by traffic on this interchange ramp. The predicted noise level was approximately 72 dBA with the Sierra interchange and slightly over 70 dBA without the interchange. Bothof these levels are just over the design noise level.

The noise levels estimated by initial analysis for Sierra Drive and Mill Road indicate that a potential noise problem would exist, particularly with respect to Rossiter School, if an interchange is constructed at either of these sites. Further, more detailed noise analysis should accompany actual design of an interchange at Sierra Drive or Mill Road.

### 5.2.11 Traffic Design

The principal objective of studying alternates for additional access to I-15 is to evaluate the effectiveness of each in diverting traffic from various surface streets to I-15. Analysis of the results of each traffic assignment therefore is an important comparison factor. A discussion of the results for each alternate is discussed later in this chapter.

The effectiveness of each alternate in diverting traffic is also reflected in the user cost measures to be discussed shortly. These two criteria are based on the vehicle miles of travel and vehicle hours of travel for all trips made in the HUTS area. These two parameters reflect the distribution of traffic on various classes of roadways travelling at different speeds, and thus provide a good way to gauge the effectiveness of new interchanges from a total systems viewpoint.

### 5.2.12 Construction Costs

Quantities for each alternative are estimated using available topographic information and typical sections developed for each roadway improvement type e.g., freeway ramps, two lane roadways and four lane roadways. Lengths of improvements are scaled. All cost data is representative of mid-1980.

Unit costs utilized are based on the Montana Department of Highways 1979 average unit prices. The following costs or derived costs were utilized in the construction cost estimates:

| | |
|---|---|
| Earthwork (>50,000 CY) | $1.65/cubic yard |
| Earthwork (<50,000 CY) | $2.50/cubic yard |
| Freeway ramps | $35.01/lineal foot |
| Two lane roadways | $54.08/lineal foot |
| Four lane roadways | $65.26/lineal foot |
| Structures | $55.00/square foot |

Right-of-way costs vary, depending on present usage of the property, proximity to residential or commercial areas and other special considerations. The values used were selected to provide representative estimate of the cost of purchasing a property in its present usage. The values used ranged from $1000/acre for rangeland to $2.70/square foot for limited amounts of residential property.

For use in additional evaluations and comparisons, construction costs have been amortized at an 8% interest rate to yield an annual cost. Pavement costs are amortized on a 20-year estimated life, grading, earthwork and structures on a 40-year estimated life, and right-of-way on a 100-year estimated life.

### 5.2.13 Construction Costs of System Improvements Saved Relative to the E+C Network

Construction of interchanges on I-15 provides access to the interstate and, in general, creates traffic shifts from surface arterials to the interstate. These traffic shifts translate into the savings of construction improvements relative tothe E+C network which would otherwise be required if traffic was not shifted.

By comparison of traffic volumes for the E+C network to traffic volumes forthe interchange alternates, it is noted that several ofthe interchange alternates and other interchange combinations reduce the traffic volumes on segments of Montana Avenue. The reductions are such that the volumes can be accommodated on a two-lane roadway instead of a four-lane roadway as would be required for the E+C network without improvements.

Clearly a principal justification for constructing new access to I-15 is the saving of roadway construction elsewhere in the street system which would be necessary under the E+C network. Accordingly, the street system requirements of each alternate were compared to those requirements of the E+C network. For differences in the construction requirements, the net savings (or gain) in system construction costs was calculated as for the alternate construction costs. The annualized costs were determined in a similar manner.

### 5.2.14 User Vehicle Operating and Travel Time Costs

The vehicle operating costs used in developing the user costs for the various alternates are modeled after operating cost information contained in the 1960 AASHO publication, Road User Benefit Analysis for Highway Improvements. The vehicle operating costs contain component costs for fuel, tires, oil, maintenance and repairs, depreciation,comfort and convenience, and accidents. travel time costs are not included in this measure. Base costs were estimated at an assumed vehicle operating speed of 32 miles per hour.

Fuel, oil, and tires costs have been adjusted based on mid-1980 costs. Maintenance and repairs, depreciation, and comfort and convenience costs have been adjusted based on current Consumer Price Index (CPI) information. Accident costs have been estimated as a percentage of the component aggregate total and have been verified with information contained in various Transportation Research Board program reports.

Vehicle operating costs for the various average roadway speeds by roadway classification in each alternative have been developed by proportioning the base operating cost at the base speed (32 mph) to the required operating cost at each operating speed. The proportionment factors used are contained in the report Economic and Traffic Analysis, Proposed Interstate 25 and Los Angeles Boulevard Interchange, 1968, prepared by the Albuquerque Metropolitan Transportation Planning Program.

Vehicle operating costs used in this corridor study vary from a high of 34.80 cents per mile at 15 mph to a low of 13.00 cents per mile at 45.7 mph. Costs vary from around 24 cents per mile to 19 cents per mile in the 26 mph to 31 mph speed range.

Travel time costs have been calculated independently of vehicle operating costs, and have been estimated at $3.00 per vehicle hour traveled. This value has been checked against available literature values, and is judged to be somewhat conservative.

The vehicle operating costs then were developed as a function of travel speed. The vehicle miles of travel (VMT) and vehicle hours of travel (VHT) data for each alternate tested by computer traffic assignment was generated by the Planning and Research Bureau. The VMT for each of several functional roadway classifications can be divided by the corresponding VHT figure to yield the effective miles per hour travel speed (MPH). The appropriate cost per mile for this MPH is applied to the corresponding VMT for each classification to yield a total user cost for the entire system. Since the only difference between systems is the various interchange alternates, a measure of user operating cost savings relative to the E+C network can be computed.

Likewise, VHT data can be used to calculate travel time savings for each alternate relative tothe E+C network. This is done by applying the cost per vehicle hour associated with user travel time to the VHT figures.

## 5.3 EVALUATION OF ALTERNATES

### 5.3.1 Alternate 1 - Mill Road Interchange

Traffic Diversion: The significant traffic diversions associated with a Mill Road interchange are listed below and shown on Figure 5.8. Year 2000 traffic volumes for this alternate are shown on Figure 5.9.

- Volumes reduced on Montana Avenue from south of Mill Road to Cedar Street in the range of 1,400 to 1,700 vehicles daily.
- Volumes on Cedar Street and Custer Avenue between Montana Avenue and I-15 reduced 1,400 and 1,800 vehicles per day, respectively.
- Volumes increased on Mill Road from Montana Avenue to I-15 by 3,900 vehicles per day.
- Volumes on I-15 increased by 2,900 vehicles daily between Mill Road and Cedar Street and 700 vehicles per day from Cedar to U.S. 12.

Relative to the E+C assignment, this alternate does divert traffic to I-15, but the effect on Montana Avenue is relatively small. The Mill Road interchange intercepts north valley traffic and carries it to Cedar Street, but half the gain is from the East Frontage Road.

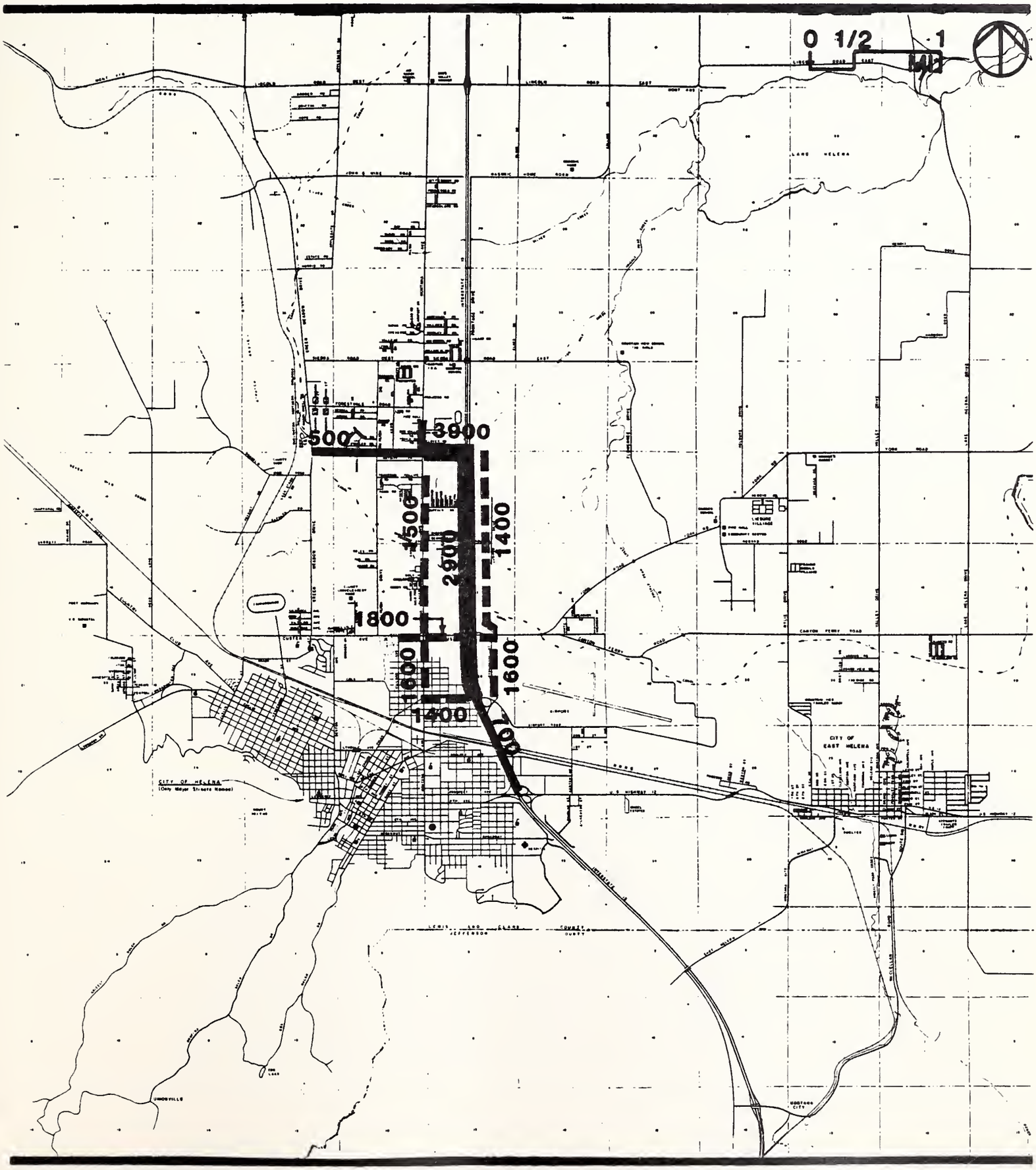
# TRAFFIC DIVERSION ALTERNATE 1
figure 5.1

**legend**

Volume Decrease

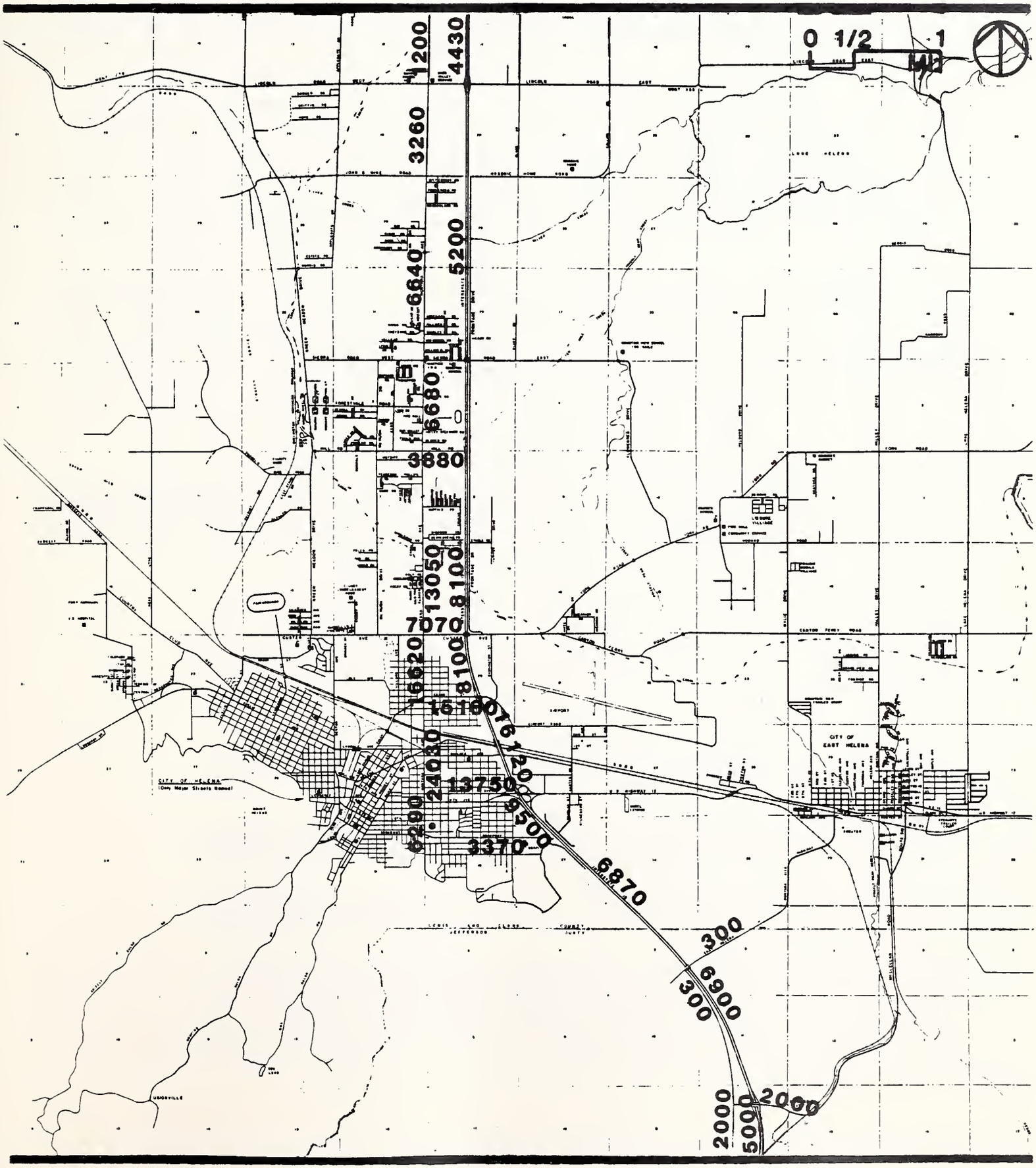
Volume Increase

5000 Volume Change Relative To E+C



legend

# TRAFFIC VOLUMES ALTERNATE 1 figure 5.2



Construction Costs: The construction cost of the Mill Road interchange is estimated at $1,913,180 including ROW and engineering for the basic interchange plus $97,010 including ROW and engineering for the connection roadway to Montana Avenue. Total estimated cost is $2,010,190. The annualized cost is $174,233.

System Improvement Costs Saved: Traffic diversion accomplished by a Mill Road interchange will eliminate the need to widen Montana Avenue to four lanes from Buffalo Road to Mill Road. The estimated savings for not widening this 3,100 foot section is $558,000.

User Costs: Vehicle operating costs for a Mill Road only interchange exceed those of the E+C network by $107 per day, or $39,055 per year. This is due to an expected increase in interstate usage, but without a sufficient decrease in surface streets mileage. Travel time costs are $174 per day, or $63,510 per year, less than those of the E+C network due to increased interstate travel at higher speeds and decreased surface street travel at lower speeds. The net effect is a $24,455 per year user savings relative to the E+C network.

Community Impact: Alternate 1 would address potential barrier problems north of Custer Drive by creating a new crossing point for areas either side of I-15. The levels of traffic diversion are such that little change in land use would be anticipated, particularly since the street with the greatest traffic increase, Mill Road, is already residentially development. The potential for some highway commercial uses at the Mill Road interchange (service station, cafe) may arise.

### 5.3.2 Alternate 2 - Mill Road and Custer Avenue Interchanges

Traffic Diversion: Significant traffic diversions achieved by a Mill Road/Custer Avenue interchange combination are listed below and shown on Figure 5.10. Year 2000 traffic volumes for this alternate are shown on Figure 5.11.

- North of Mill Road, Montana Avenue loses 700 vehicles per day and I-15 gains a like number.
- Between Mill Road and Cedar Street, Montana Avenue loses 3,200 to 4,400 vehicles daily, and from Cedar to Broadway about 1,000 vehicles daily.
- Traffic on the East Frontage Road drops 1,400 per day, on Washington Street - 4,400 vehicles, and on Airport Way and Carter Lane - 1,000 vehicles.
- Between Montana Avenue and I-15, Mill Road increases 5,200 vehicles daily, Custer increases 3,300 vehicles, and Cedar drops 2,900 vehicles.
- I-15 gains 7,400 to 8,300 vehicles from Mill Road to Cedar Street and 2,200 from Cedar to U.S. 12.

This scheme is much more effective than Alternate 1 because of the Custer Avenue interchange. The volumes on Montana are reduced by about 34% at their greatest, and those on I-15 increase about 150%. Impacts to U.S. 12 are minor. The Custer interchange clearly increases the use of I-15 for access to the shopping and employment activities in this area.

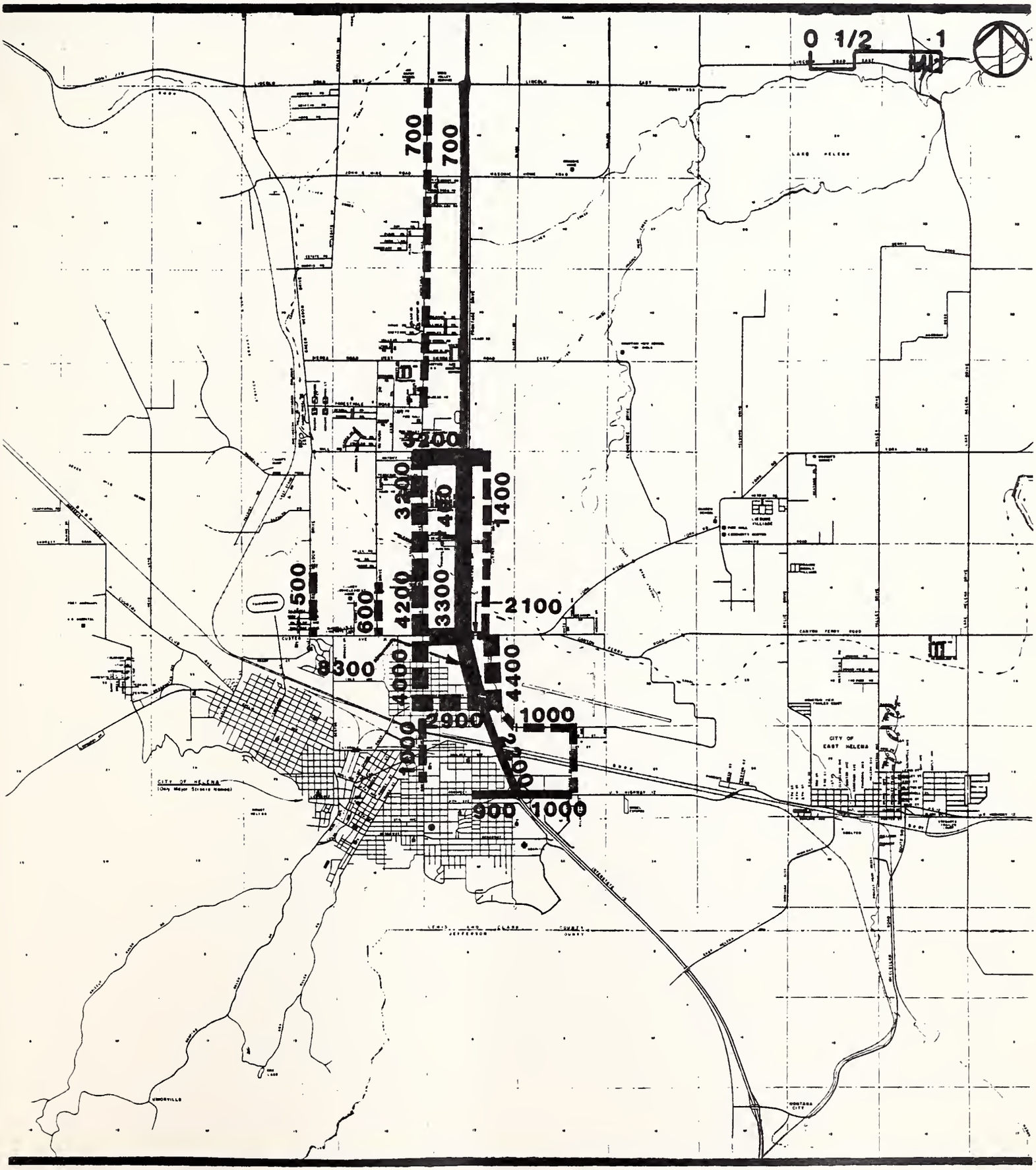
# TRAFFIC DIVERSION ALTERNATE 2 figure 5.3

**legend**

Volume Decrease

Volume Increase

5000 Volume Change Relative To E+C



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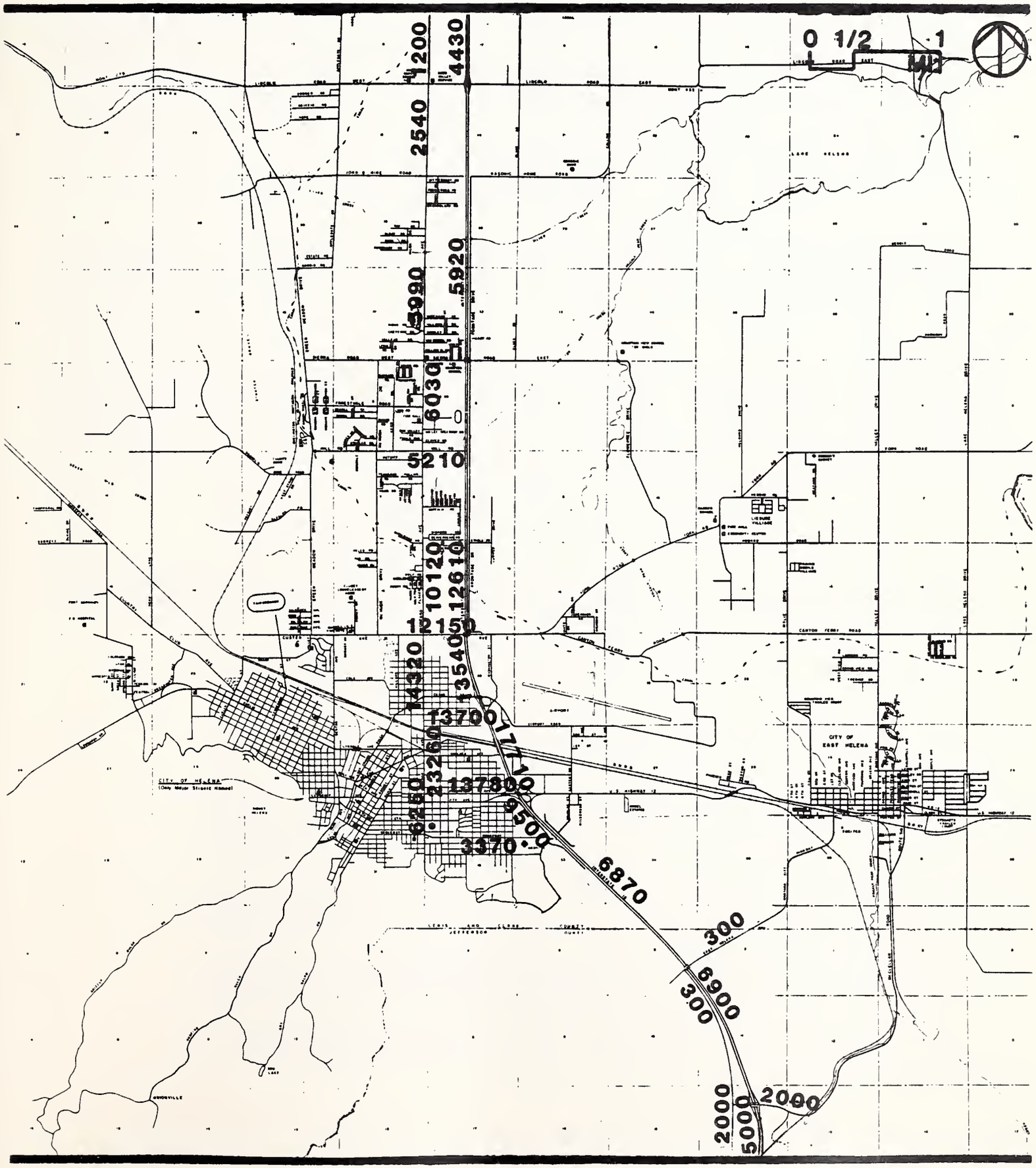
# TRAFFIC VOLUMES ALTERNATE 2 figure 5.4



Construction Costs: The construction cost of a Mill Road/Custer Avenue interchange combination is estimated at $2,447,900 including ROW and engineering for the interchanges plus $97,010 including ROW and engineering for the connecting roadway to Montana Avenue. Total estimated cost is $2,544,910. The annualized cost is $222,243.

Systems Improvement Costs Saved: Traffic diversion accomplished by a Mill Rd./Custer Ave. interchange combination will eliminate the need to widen Montana Avenue to four lanes from the Frontier Mall to Mill Road. The estimated savings for not widening this 9,660 foot section of Montana is $1,738,800. Construction of the Custer Avenue interchange will, however, require widening of Custer to four lanes from I-15 to Frontier Mall. The extra systems improvement cost or widening this 2,000 foot section is estimated at $360,000. The net system improvement savings for the interchange combination is $1,378,800.

User Costs: Vehicle operating costs for a Mill Road/Custer Avenue interchange combination are $865 per day ($315,525 per year) less than the E+C network costs, due to a net decrease in surface streets mileage. Travel time costs are $459 per day ($167,535 per year) less than the E+C network costs. The net effect is a $483,260 per year user savings relative to the E+C network.

Community Impact: Alternate 2 is equivalent to Alternate 1 in reducing the barrier effect. The direct land use impacts Mill Road and I-15 would be similar but potentially greater because of the higher level of traffic. At Custer Avenue, the additional traffic could reinforce the interchange and the strip commercial development which will likely occur because of the proposed shopping center.

### 5.3.3 Alternate 3 - East Helena Interchange and Broadway Avenue Extension

Traffic Diversion: Significant traffic diversions achieved by an East Helena Interchange with a Broadway Avenue Extension are listed below and shown on Figure 5.12. Year 2000 traffic volumes for Alternate 3 are shown on Figure 5.13.

- Volumes on Prospect Avenue from Fee to Colonial Drive were reduced by 3000 vehicles per day.
- Volumes on 11th Avenue east of Fee decreased by 4,000 vehicles per day.
- Colonial Drive traffic volumes decreased by 6,400 vehicles per day from Fee to California and by 3,900 vehicles per day from California to Broadway.
- Volumes on I-15 from East Helena to U.S. 12 were decreased by 960 vehicles per day.
- Volumes on California Street from Broadway to Colonial were decreased by 2,500 vehicles per day.
- Volumes on Beltview Drive from California to Saddle were decreased by 1,200 vehicles per day.

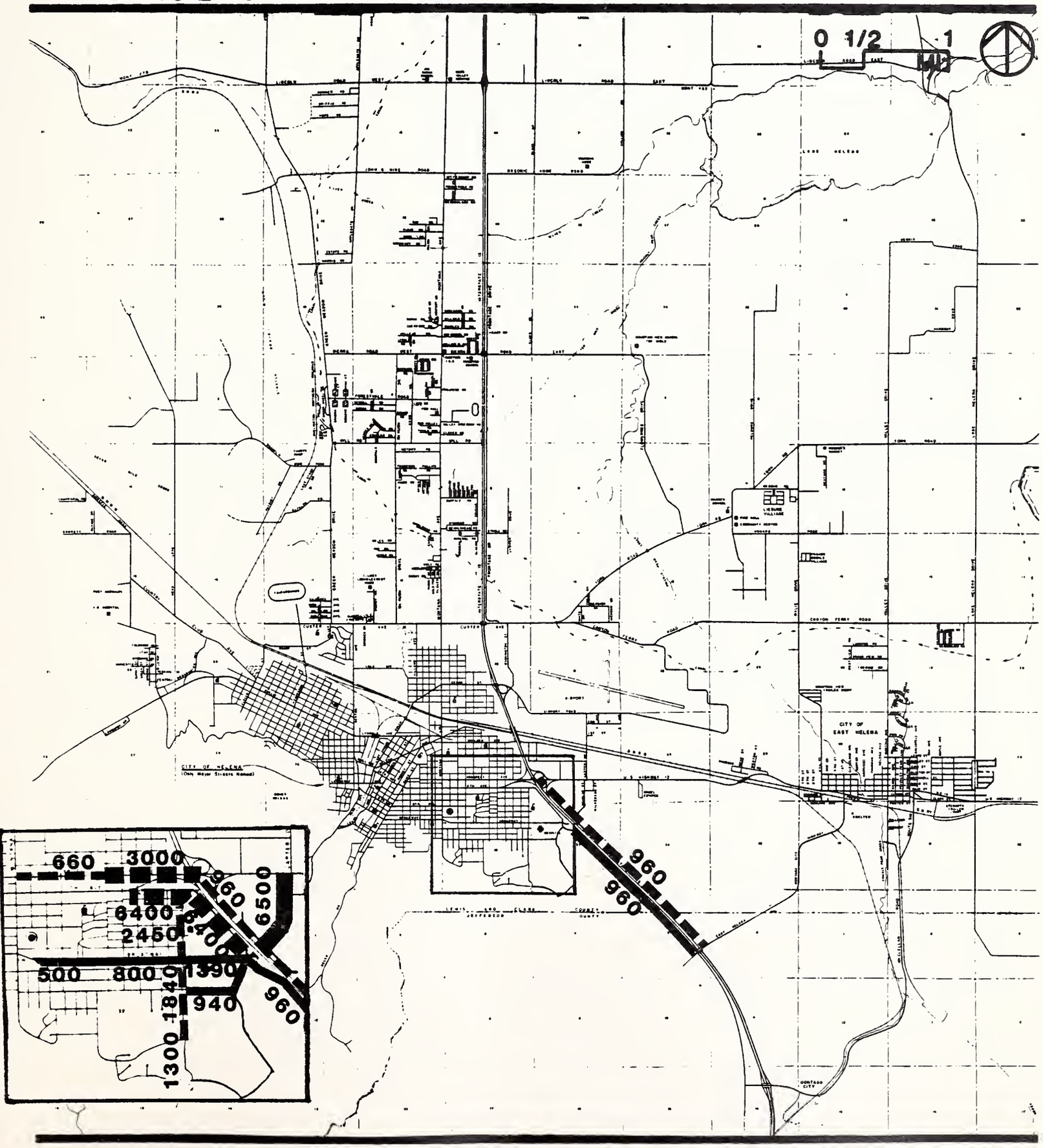
# TRAFFIC DIVERSION ALTERNATE 3
figure 5.5

**legend**

Volume Decrease

Volume Increase

5000. Volume Change Relative To E+C



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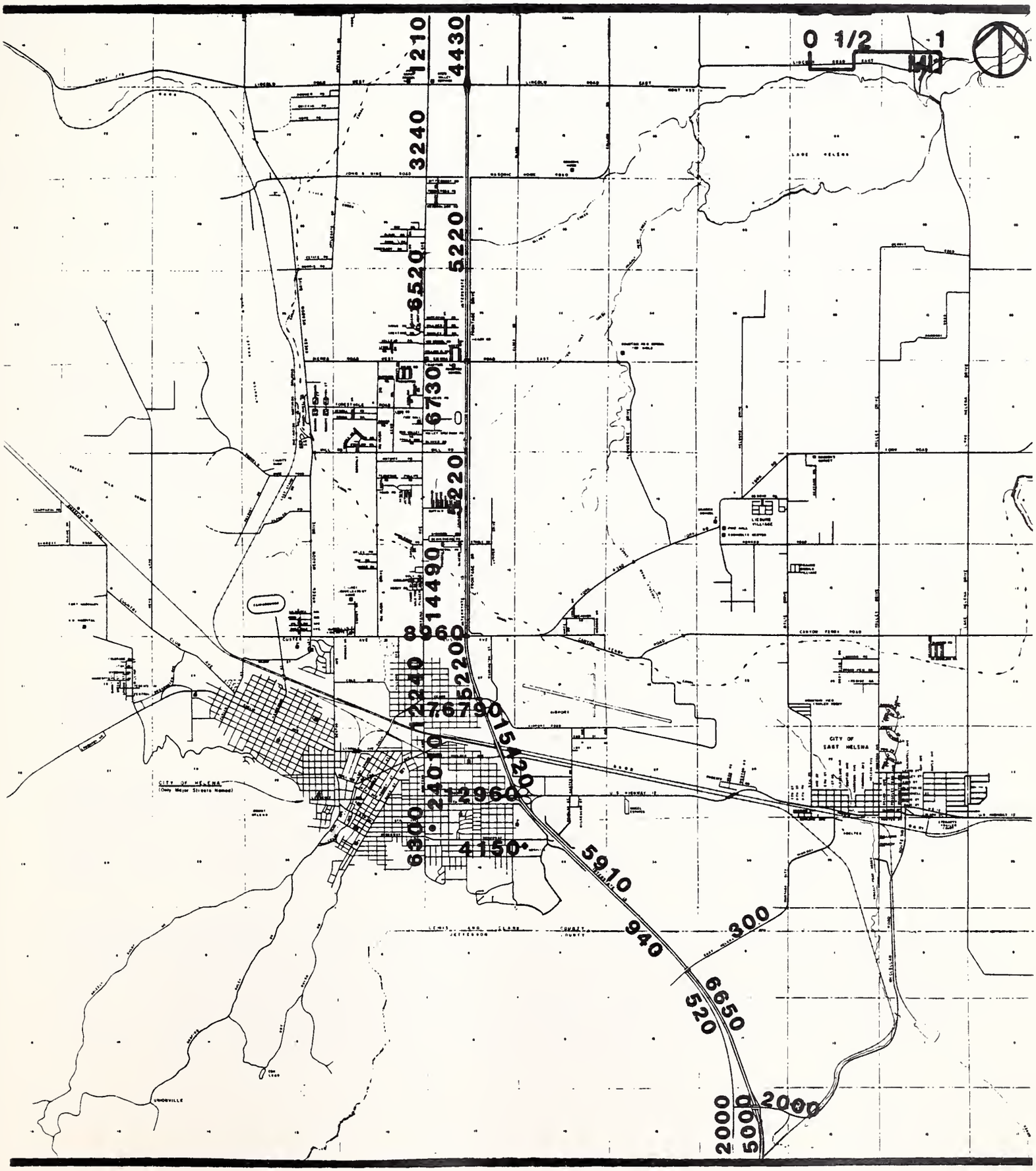
# TRAFFIC VOLUMES
# ALTERNATE 3
# figure 5.6



- Volumes on Broadway increased by 800 vehicles per day west of California and by 1,400 vehicles per day from California to Colonial Drive.

- Volumes on the Broadway extension were 6,500 vehicles per day.

- Traffic volumes on California from Colonial Drive to Broadway were decreased by 2,500 vehicles per day.

- Volumes on Winne Avenue west of California increased by 370 vehicles per day.

- Volumes on the Colonial Drive and Beltview extensions were 800 and 160 vehicles per day respectively.

- Volumes on the West Frontage Road from Beltview to East Helena were 960 vehicles per day.

The addition of a frontage road along I-15 north of East Helena diverts some traffic from the interstate because it provides a more direct route into the southern part of the City. Traffic that is headed for destinations east of California along Broadway is better served by using the frontage road from East Helena north. The Broadway extension diverts a good deal of westbound traffic from U.S. 12 between the extension and I-15, however, the two-way volume on U.S. 12 remains almost unchanged because I-15 traffic headed for the highway department office and the proposed Helena Mall exits the interstate at U.S. 12 and uses the Broadway extension to go south.

Construction Costs: The construction cost of an East Helena Road/Broadway Avenue interchange combination is estimated at $1,361,790 including ROW and engineering for the interchange plus $265,580 including ROW and engineering for the connecting integral roadways. Total estimated cost is $1,627,370. The annualized cost is $144,399.

Systems Improvement Costs Saved: Traffic diversion resulting from construction of an East Helena interchange with a Broadway Avenue extension is not extensive enough to eliminate any of the systems improvement costs required by the E+C network.

User Costs: Vehicle operating costs for an East Helena Road/Broadway interchange combination are $661 per day ($241,265 per year) less than the E+C network costs. Travel time costs are $66 per day ($24,090 per year) less than the E+C network costs. The net effect is a $265,355 per year user savings relative to the E+C network.

Community Impact: Alternate 3 lessens the barrier effect south of U.S. 12 by providing cross-overs at East Helena Road and at Broadway. The latter point would permit extension of the East Helena Dikeway across I-15 and towards the Capitol area. This alternate is not anticipated to radically influence load use patterns since a large tract to the east is owned by the Department of Highways and residential and commercial uses are zoned and developing on the west side.

### 5.3.4 Alternate 4 - Beltview Drive Interchange

Traffic Diversion: Listed below and shown on Figure 5.14 are the significant traffic diversions achieved by a Beltview Drive Interchange. Figure 5.15 shows the projected year 2000 traffic volumes for Alternate 3.

- Volumes on Prospect Avenue were reduced by 3,900 vehicles per day west of I-15 and by 2,000 vehicles per day east of I-15.
- Volumes on 11th Avenue were reduced by 1,500 vehicles per day between Lamborn Street and I-15.
- Volumes on Colonial Drive decreased by 4,600 vehicles per day between Lamborn Street and California Street and by 2,900 vehicles per day from California to Broadway.
- Volumes decreased by 1,400 to 1,600 vehicles per day on California Street from Beltview to 11th Avenue.
- Volumes on Beltview from California to Saddle decreased by 1,300 vehicles per day.
- Volumes on the Beltview extension ranged from 1,400 to 1,900 vehicles per day.
- Volumes on the Colonial Drive extension were 3,600 vehicles per day.

This alternative diverts traffic from U.S. 12, Prospect Avenue, 11th Avenue, and Colonial Drive near the U.S. 12/I-15 interchange. Beltview/I-15 interchange and the extensions of Beltview and Colonial Drive provide more direct access to destinations that include the highway department office and proposed Helena Mall. There is no gain in traffic west of California Street which itself loses volume.

Construction Costs: The construction cost of a Beltview Drive interchange is estimated at $1,161,110 including ROW and engineering for the interchange plus $209,410 including ROW and engineering for the connecting roadways. Total estimated cost is $1,370,520. The annualized cost is $120,950.

Systems Improvement Costs Saved: Construction of a Beltview Drive interchange will not provide sufficient traffic diversion to eliminate any of the systems improvement costs required by the E+C network.

User Costs: Vehicle operating costs for a Beltview Drive only interchange are $506 per day ($184,690 per year) less than the E+C network costs. Travel time costs are $123 per day ($44,895 per year) less than the E+C network costs. The net effect is a $229,585 per year user savings relative to the E+C network.

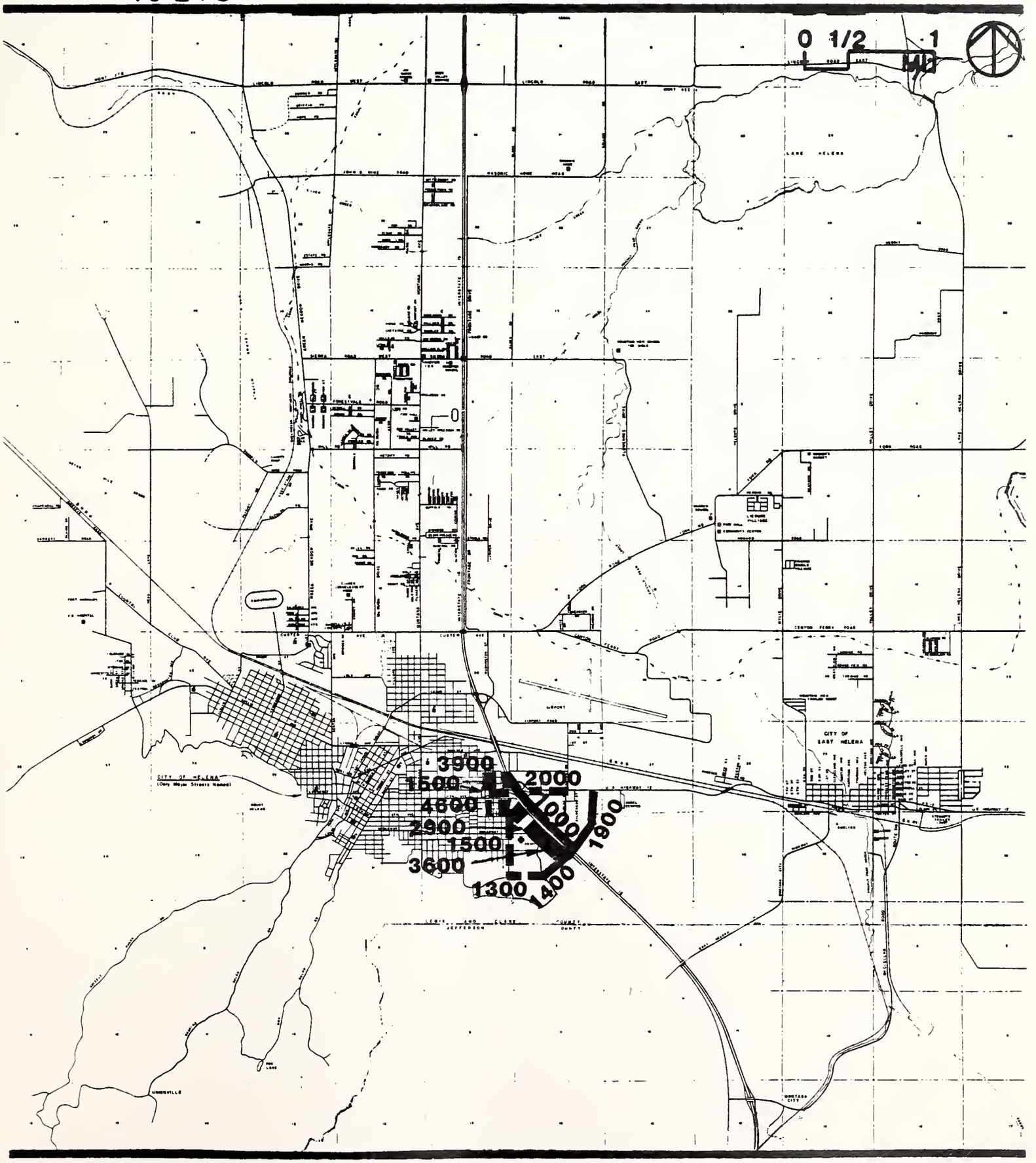
# TRAFFIC DIVERSION ALTERNATE 4
# figure 5.7

**legend**

Volume Decrease

Volume Increase

5000 Volume Change Relative To E+C



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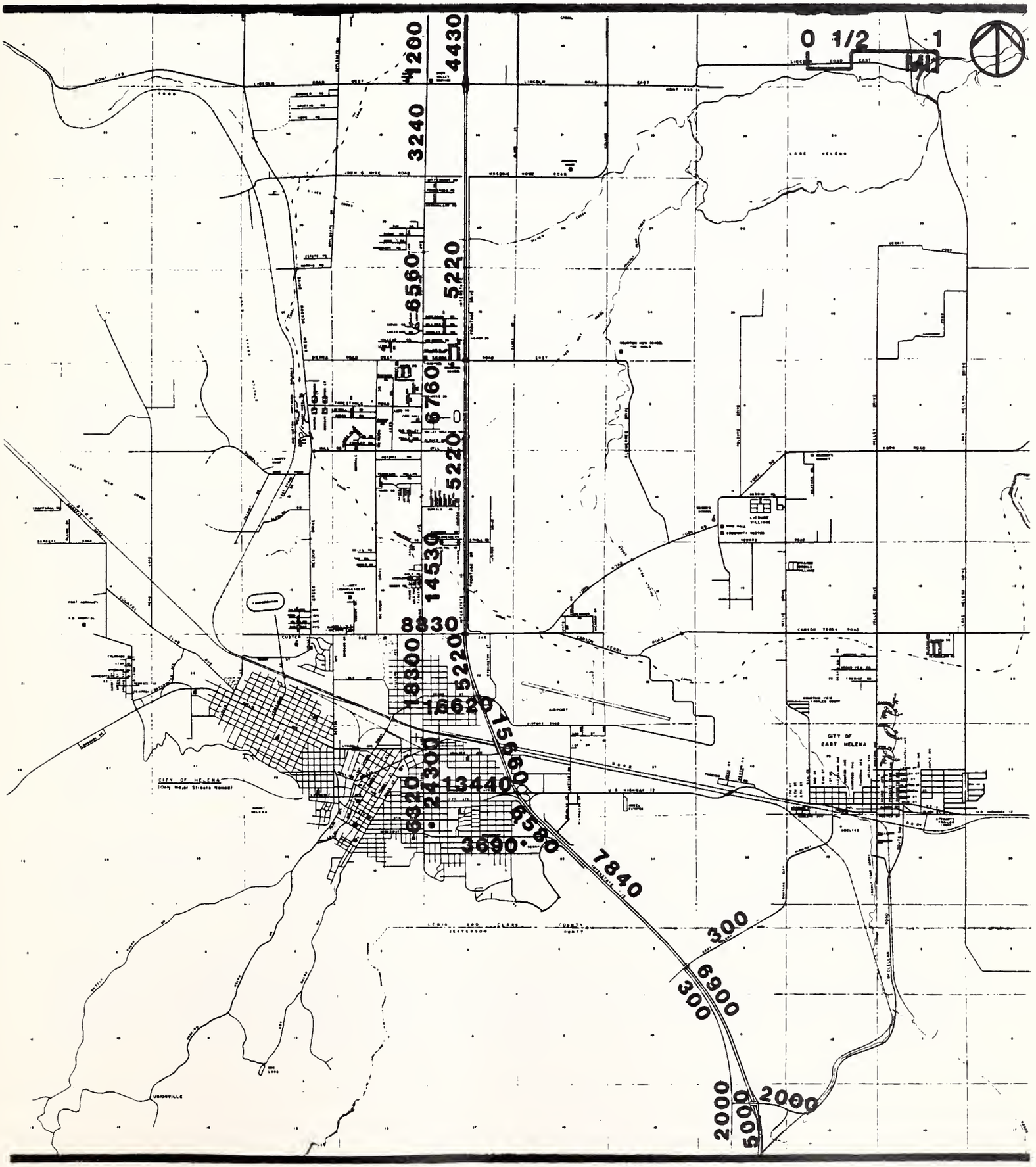
# TRAFFIC VOLUMES
# ALTERNATE 4
# figure 5.8



Community Impact: Alternate 4 is less beneficial than Alternate 3 in reducing the barrier effect south of U.S. 12, providing only the crossover at Beltview Drive. A pedestrian overpass between Beltview Drive and U.S. 12 would be needed to address current problems in this area, but the cost is high for the expected level of use. The impact on land use patterns would be essentially the same as those for Alternate 3.

### 5.3.5 Alternate 5 - Mill Road, Custer Avenue, and Beltview Drive Interchanges

Traffic Diversion: The significant traffic diversions achieved by a Mill Road/Custer Avenue/Beltview Drive interchange combination are listed below and shown on Figure 5.16. Year 2000 projected traffic volumes for Alternate 5 are shown on Figure 5.17.

- Traffic shifts to the north of U.S. 12 are essentially the same as those for Alternate 1, while those to the sough of U.S. 12 are basically the same as for Alternate 4.

- Volume reductions on U.S. 12 from Alternate 4 relative to the E+C assignment are about 1,100 vehicles per day less because of the traffic increases on U.S. 12 attributable tothe improvements under Alternate 2.

Generally the comments for Alternates 2 and 4 are valid for Alternate 5. The redistribution effects of Alternates 2 and 4 individually are the same as the two collectively.

Construction Costs: The construction cost of a Mill Road/Custer Avenue/Beltview Drive interchange combination is estimated at $3,608,010 including ROW and engineering for the basic interchanges plus $306,420 including ROW and engineering for the connecting integral roadways. Total estimated cost is $3,915,430. The annualized cost is $343,193.

Systems Improvement Costs Saved: Traffic diversion accomplished by a Mill Rd./Custer Ave./Beltview Dr. interchange combination will eliminate the need to widen Montana Avenue to four lanes from the Frontier Mall to Mill Road. The estimated savings for not widening this 9,660 foot section of Montana is $2,738,800. Construction of the Custer Avenue interchange will, however, require the widening of Custer tofour lanes from I-15 to Frontier Mall. The extra systems improvement cost of widening this 2,000 foot section is estimated at $360,000. The net system improvement savings for the interchange combination is $1,378,800.

User Costs: Vehicle operating costs for Mill Road/Custer Avenue/Beltview Drive only interchange are $1,096 per day ($400,040 per year) less than the E+C network costs. Travel time costs are $585 per day ($213,525 per year) less than the E+C network costs. The net effect is a $613,565 per year user savings relative to the E+C network.

Community Impact: Alternate 5 is the equivalent of Alternates 2 and 4 in terms of mitigating barrier effects. Land use impacts would likewise be similar. The combined effect of three new interchange locations may tend to heighten the influence of I-15 on land use patterns somewhat.

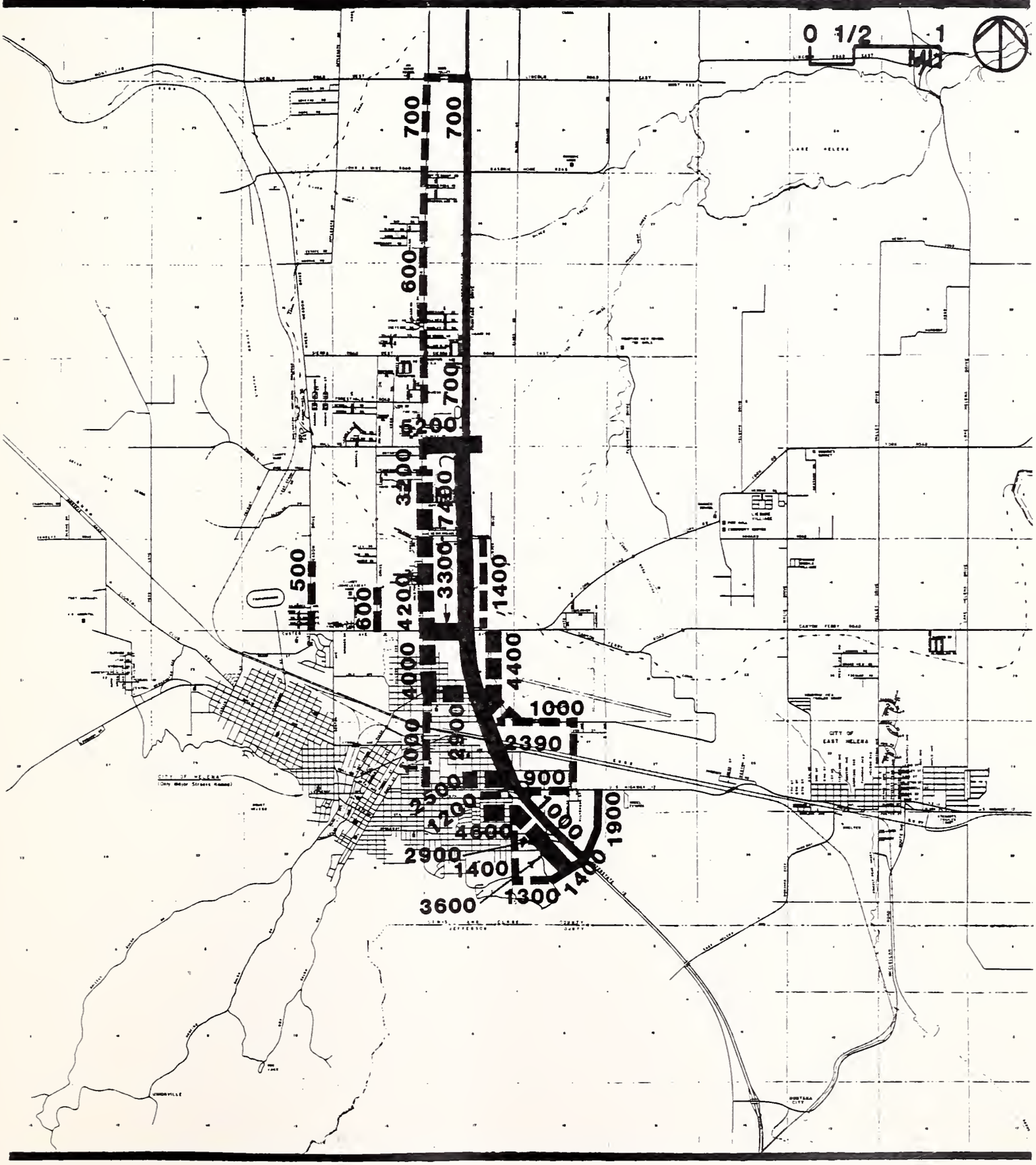
# TRAFFIC DIVERSION ALTERNATE 5
figure 5.9

**legend**

Volume Decrease

Volume Increase

5000 Volume Change Relative To E+C



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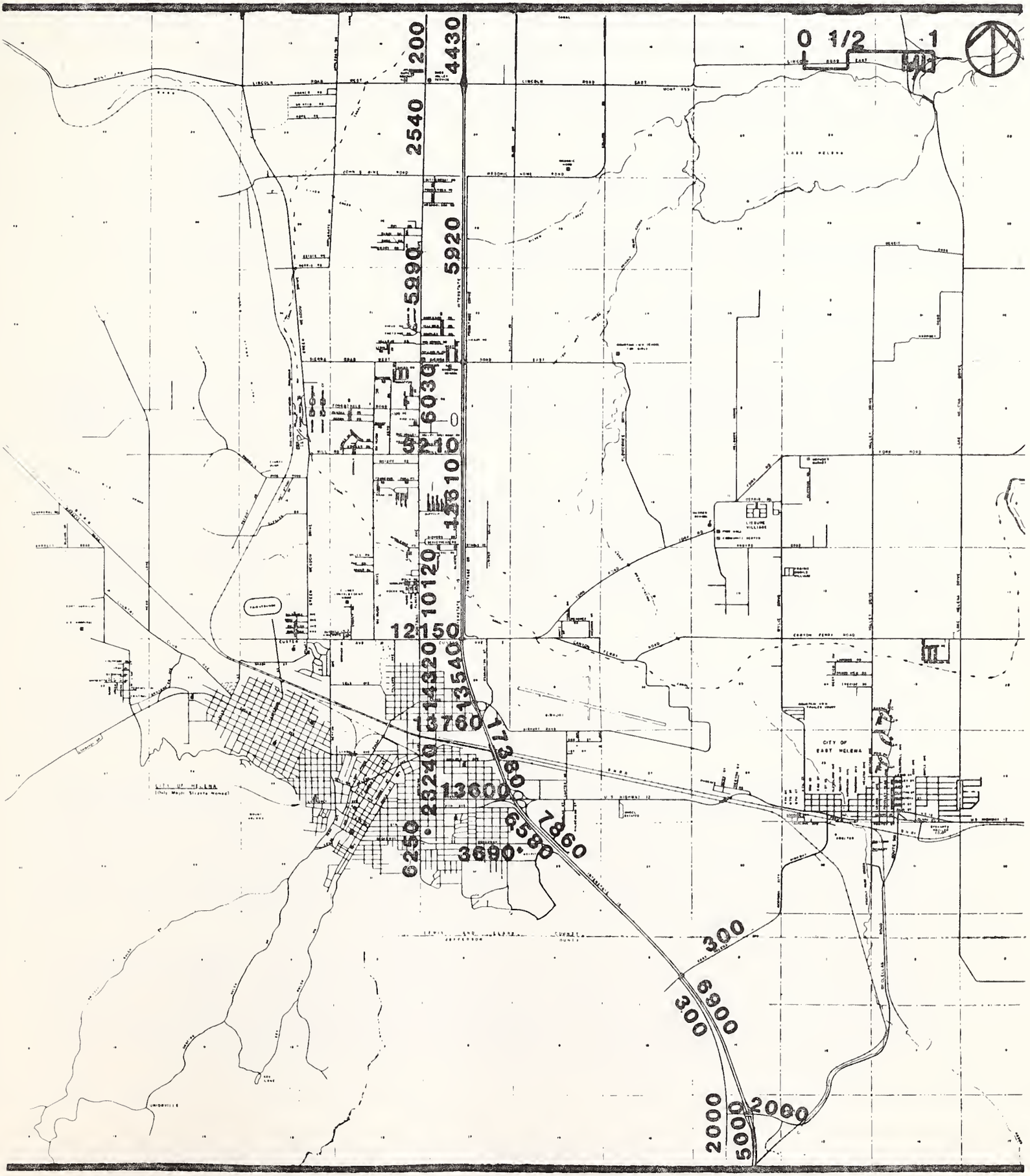
# TRAFFIC VOLUMES ALTERNATE 5 figure 5.10



### 5.3.6 Alternate 6 - Sierra Drive Interchange

Traffic Diversion: Listed below and shown on Figure 5.18 are the significant traffic diversions generated by a Sierra Drive interchange. Figure 5.19 shows the projected year 2000 traffic volumes for this alternate.

- Volumes reduced on Montana Avenue from Sierra Drive to Cedar Street by 1,100 to 1,400 vehicles daily.
- Volumes on East Frontage Road and Washington Avenue decreased by 1,300 vehicles daily.
- Volumes on I-15 from the Cedar Street interchange to Sierra Drive increased by 2,600 vehicles daily.
- Volumes on Cedar Street between Montana Avenue and the East Frontage Road decreased by 800 vehicles daily.
- Volumes on Sierra Drive increased by 1,200 vehicles daily from I-15 to Montana Avenue.

This alternate diverts traffic from Montana to I-15 in a similar, but slightly less effective manner than Alternate 1. The Sierra Drive interchange draws North Valley traffic to I-15 and carries it to Cedar Street, however only half the gain is from Montana Avenue.

Construction Costs; The interchange improvements at Sierra Drive are identified as Sierra "A", which is a slip-ramp improvement, and Sierra "B", which is a more conventional type of interchange. The construction costs of the Sierra "A" interchange is $346,510 including ROW and engineering, and the amortized annual cost is $31,406. The construction cost of the Sierra "B" interchange is $539,720 including ROW and engineering, and the cost is $49,384. Neither interchange requires connecting integral roadways.

Systems Improvement Costs Saved: Construction of a Sierra Drive "A" interchange will result in sufficient traffic diversion to eliminate the need to widen a 3,500 foot section of Montana Avenue from Buffalo Road to Cloverleaf Road. The estimated widening cost saved is $630,000.

User Costs: Vehicle operating costs for an interchange at Sierra Drive are $302 per day ($110,230 per year) greater than the E+C network costs. Like a Mill Road only interchange, there is an expected increase in interstate usage, but without a sufficient decrease in surface streets mileage. Travel time costs are $123 per day ($44,895 per year) less than E+C network costs. The net effect is a $65,335 per year increase in user costs relative to the E+C network. The net effect is a $65,335 per year increase in user costs relative to the E+C network.

Community Impact: Alternate 6 might be similar to Alternate 1 in terms of land use impacts except that induced volumes on Sierra Drive are probably not great enough to stimulate significant land use changes at the interchange. Moreover only one quadrant of the interchange is undeveloped. This alternate does not reduce the barrier effect caused by I-15 since it is situated at an existing grade separation.

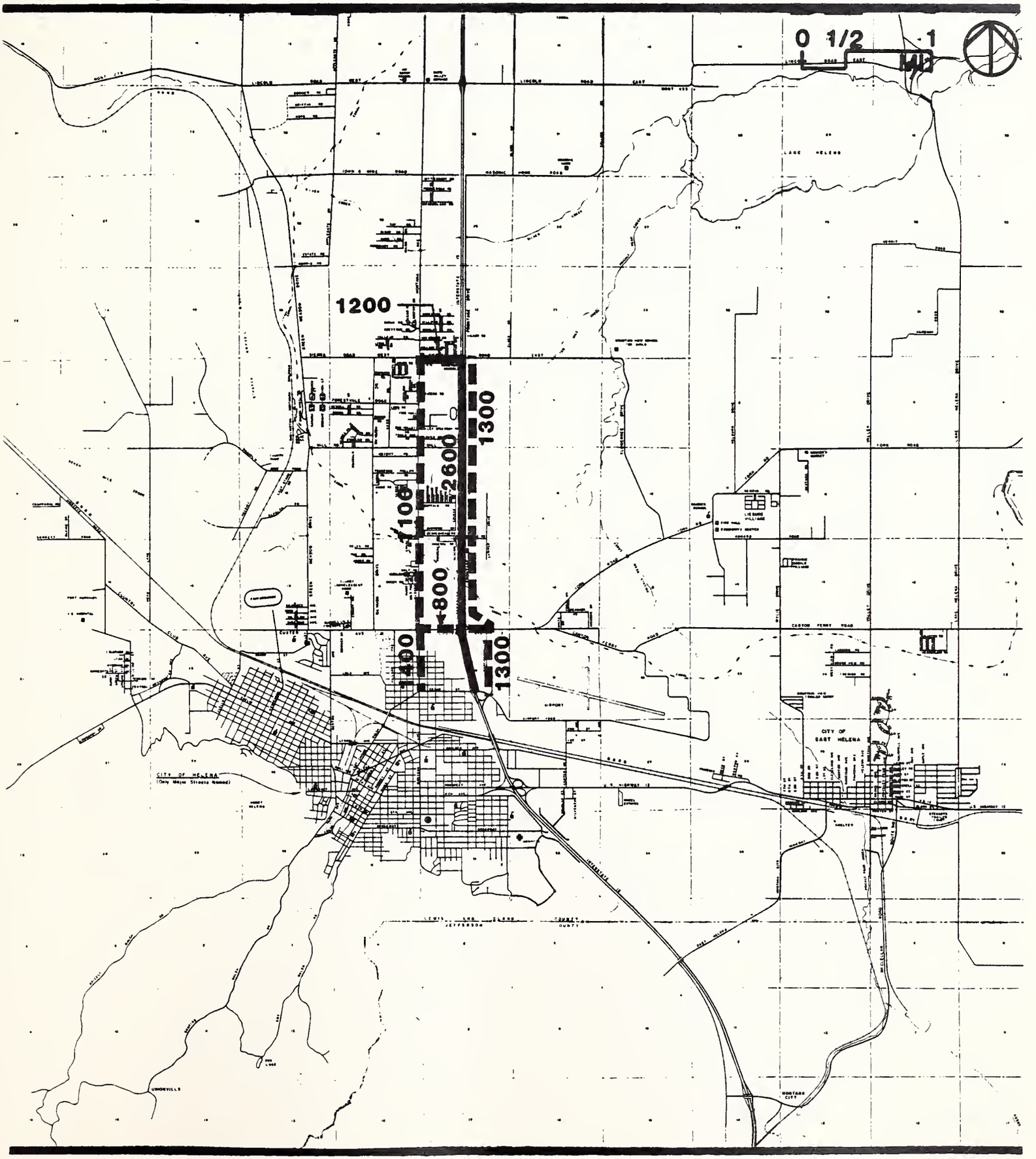
# TRAFFIC DIVERSION ALTERNATE 6 figure 5.11

**legend**

Volume Decrease

Volume Increase

5000 Volume Change Relative To E+C



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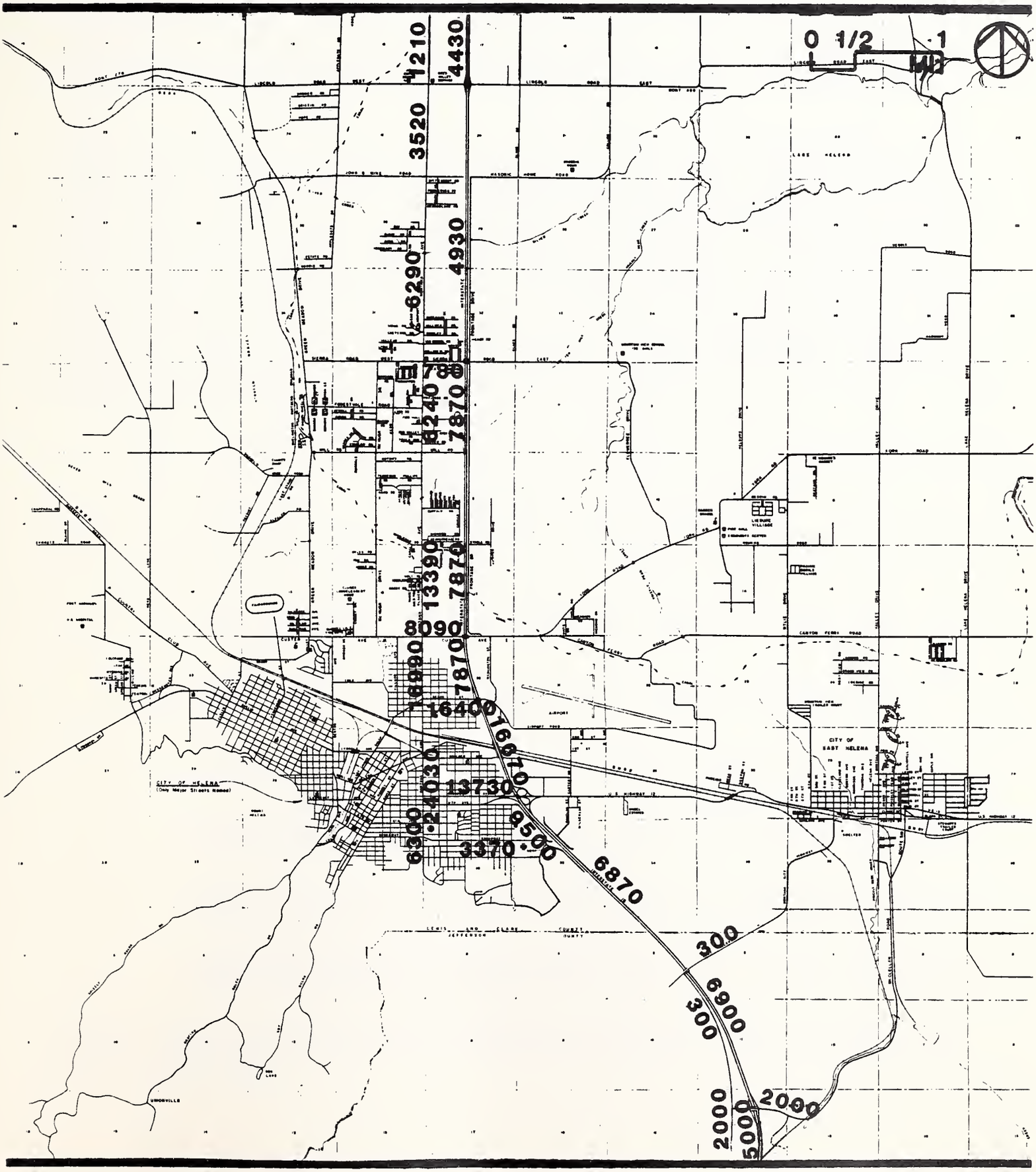
# TRAFFIC VOLUMES
# ALTERNATE 6
# figure 5.12



### 5.3.7 Other Alternatives

The several improvements described in Chapter 4 could be combined into a large number of distinct alternates. Time and resource limitations permitted traffic assignments and other evaluations for only six options. However, in the course of evaluating the six basic alternates defined earlier, it was found that vehicle operating costs, travel time costs, and systems improvement cost savings could be inferred from the calculations for the six basic alternates.

These estimated costs are based on the differences in effectiveness between individual component interchanges. An example would be that since a Mill Road interchange is more effective than a Sierra Drive interchange (relative to the E+C network), a Mill Road/Custer Avenue combination would logically be more effective than a Sierra Drive/Custer Avenue combination. Likewise, since Forestvale Road is located approximately halfway between Mill Road and Sierra Drive, the effectiveness of a Forestvale Road interchange can be reasonably assumed to be approximately halfway between that of a Sierra Drive interchange and a Mill Road interchange. With the preceding presumptions in mind, cost parameters relative to the E+C network for these other improvement packages have been estimated. The other impacts for these hybrid alternatives can be identified by referring to the appropriate basic alternates which comprise these alternatives.

A total of nine other alternatives were defined by this process. These are:

- Sierra Drive "a" Interchange/Custer Avenue Interchange
- Sierra Drive "B" Interchange/Custer Avenue Interchange
- Forestvale Road Interchange/Custer Avenue Interchange
- Sierra Drive "A" Interchange/Custer Avenue Interchange/ Beltview Drive Interchange
- Sierra Drive "A" Interchange/Custer Avenue Interchange/Beltview Drive Interchange
- Forestvale Road Interchange/Custer Avenue Interchange/Beltview Drive Interchange
- Sierra Drive "A" Interchange/Custer Avenue Interchange/East Helena Road Interchange with Broadway Underpass
- Sierra Drive "B" Interchange/Custer Avenue Interchange/East Helena Road Interchange with Broadway Underpass
- Forestvale Road Interchange/Custer Avenue Interchange/East Helena Road Interchange with Broadway Underpass

The interchange construction costs, systems improvement cost savings, and user operating and travel time costs for these alternatives are tabulated in the last section of this chapter.

## 5.4 EVALUATION SUMMARY

This section presents summary tables of the construction costs, user costs, and systems improvement savings calculated for the various improvement packages studied. The user costs and systems improvement costs listed are relative to those or the E+C network with projected year 2000 traffic to provide a clearer basis for comparison between alternates.

Table 5.1 summarizes the construction cost and systems improvement savings for each alternate. Construction costs shown in the table vary from approximately $350,000 for the Sierra Drive interchange Concept A to just under $4 million for the combination of interchanges on Mill Road, Custer Avenue and Beltview Drive. The systems improvement savings shown in the table are maximized by any combination of a north interchange and an interchange at Custer Avenue, while no systems improvement savings result from a south improvement alone. The net construction costs (savings0, derived by subtracting systems improvement costs from construction costs, indicate that only alternates with a Sierra Drive interchange alone or combined with a Custer Avenue interchange result in net construction savings. On the other hand, the most costly alternates are those which involve south improvements only or in conjunction with the more expensive Mill Road or Forestvale Road interchanges to the north.

Annual user costs for each alternate are shown in Table 5.2 which lists costs/savings relative to the E+C network for user vehicle operating costs and use travel time costs. The user costs associated with each improvement combination not actually tested were estimated, as explained in the table footnotes, by combining the computed user costs for its component improvements to reflect the overall effectiveness of the combination. Total user costs were calculated by combining the costs (savings) for vehicle operating costs and travel time savings. As indicated by the table, those alternates which offer the most access to I-15 result in the greatest annual user cost savings, while the alternates which consist of a lone interchange in either the north or the south offer little or no savings. Alternate 5, the Mill/Custer/Beltview interchange combination yields annual user cost savings of over $610,000 tomake it the most effective alternate. However, each of the other alternates which are combinations of a Sierra or Forestvale interchange with a Custer interchange and a Beltview or East Helena (with Broadway extension) interchange offer user cost savings of within $90,000 of that figure.

Table 5.3 presents the annualized construction costs for each alternate and provides a comparison with annual user costs and annualized systems improvement costs. The net annual cost (savings) shown in Table 5.3 is simply the annualized construction cost minus the annual user costs and the annualized systems improvement savings. This figure ranges from a cost of just over $98,000 for the Mill Road interchange alone to a savings of $369,000 for the Sierra A/Custer/East Helena (Broadway) combination. The table indicates that the greatest annual net savings are obtainable from those alternates which consist of Sierra Drive and Custer interchanges with or without a south interchange at Beltview Drive or East Helena Road.

TABLE 5.1
COMPARISON OF CONSTRUCTION COSTS AND SYSTEMS IMPROVEMENT SAVINGS RELATIVE TO THE E+C NETWORK

| | Alternate | Construction Cost ($) | Sys. Impr. Savings ($)* | Net Construction Cost (Savings) |
|---|---|---|---|---|
| 1 | Mill Road | 2,010,910 | ( 558,000)[1] | 1,452,910 |
| 2 | Mill/Custer Ave. | 2,544,910 | (1,378,800)[2] | 1,166,110 |
| 3 | East Helena/ Broadway Extension | 1,627,370 | --- | 1,627,370 |
| 4 | Beltview Drive | 1,370,520 | --- | 1,370,520 |
| 5 | Mill/Custer/Beltview | 3,915,430 | (1,378,800)[2] | 2,536,630 |
| 6 | Sierra Drive A | 346,510 | ( 630,000)[3] | ( 283,490) |
| 6 | Sierra Drive B | 539,720 | ( 630,000)[3] | ( 90,280) |
| | Sierra A/Custer | 881,230 | (1,378,800)[2] | ( 497,570) |
| | Sierra B/Custer | 1,074,440 | (1,378,800)[2] | ( 304,360) |
| | Forestvale/Custer | 1,980,030 | (1,378,800)[2] | 601,230 |
| | Sierra A/Custer/ Beltview | 2,251,750 | (1,378,800)[2] | 872,950 |
| | Sierra B/Custer/ Beltview | 2,444,960 | (1,378,800)[2] | 1,066,160 |
| | Forestvale/Custer/ Beltview | 3,350,550 | (1,378,800)[2] | 1,971,750 |
| | Sierra A/Custer/ E. Helena | 1,840,140 | (1,378,800)[2] | 461,340 |
| | Sierra B/Custer/ E. Helena | 2,033,350 | (1,378,800)[2] | 654,550 |
| | Forestvale/Custer/ E. Helena | 2,938,940 | (1,378,800)[2] | 1,560,140 |

* Relative to improvements required for E+C network

1 Montana Avenue - Buffalo Rd. to Mill Rd.
3,100 LF @ $180/LF

2 Montana Avenue - Frontier Mall to Mill Rd.
9,660 LF @ $180/LF less Custer Ave - 2000 ft.
west from I-15 @ $180/LF

3 Montana Avenue - Buffalo Rd. to Cloverleaf Rd.
3,500 LF @ $180/LF

TABLE 5.2
ANNUAL USER COSTS RELATIVE TO USER COSTS FOR THE E+C NETWORK

| | Alternate | RELATIVE VMT Costs ($) | RELATIVE VHT Costs ($) | RELATIVE Total Costs ($) |
|---|---|---|---|---|
| 1 | Mill Road | 39,055 | ( 63,510) | ( 24,455) |
| 2 | Mill/Custer Ave. | (315,725) | (167,535) | (483,260) |
| 3 | East Helena/Broadway Extension | (241,265) | ( 24,090) | (265,355) |
| 4 | Beltview Drive | (184,690) | ( 44,895) | (229,585) |
| 5 | Mill/Custer/ Beltview | (400,040) | (213,525) | (613,565) |
| 6 | Sierra Drive [1] | 110,230 | ( 44,895) | 65,335 |
| | Sierra/Custer | (244,550) [2] | (148,920) [2] | (393,470) [2] |
| | Forestvale/Custer | (280,138) [3] | (158,227) [3] | (438,365) [3] |
| | Sierra/Custer/ Beltview | (328,865) [4] | (194,910) [4] | (523,775) [4] |
| | Forestvale/Custer/ Beltview | (364,453) [5] | (204,217) [5] | (568,670) [5] |
| | Sierra/Custer/ E. Helena | (385,440) [6] | (174,105) [6] | (559,545) [6] |
| | Forestvale/Custer/ E. Helena | (421,028) [7] | (183,412) [7] | (604,440) [7] |

* Costs noted ( ) indicate a savings.

1 Annual user costs do not vary between Sierra Dr. Concept A and B.

2 Annual Costs estimated as Alt. 2 Costs minus the difference in effectiveness of Alt. 1 and Alt. 6 Costs.

3 Annual Costs estimated as Alt. 2 Costs minus one-half the difference in effectiveness of Alt. 1 and Alt. 6 Costs.

4 Annual Costs estimated as Alt. 5 Costs minus the difference in effectiveness of Alt. 1 and Alt. 6 Costs.

5 Annual Costs estimated as Alt. 5 Costs minus one-half the difference in effectiveness of Alt. 1 and Alt. 6 Costs.

6 Annual Costs estimated as Alt. 5 Costs minus the difference in effectiveness of Alt. 1 and Alt. 6 Costs minus the difference in effectiveness of Alt. 3 and Alt. 4 Costs.

7 Annual Costs estimated as Alt. 5 Costs minus one-half the difference in effectiveness of Alt. 1 and Alt. 6 Costs minus the difference in effectiveness of Alt. 3 and Alt. 4 Costs.

TABLE 5.3

COMPARISON OF ANNUALIZED CONSTRUCTION COSTS, ANNUAL USER COSTS, AND ANNUAL SYSTEMS IMPROVEMENT SAVINGS RELATIVE TO THE E+C NETWORK

| Alternate | Annualized Constr. Costs | Annual User Costs (Savings) | Annualized Syst. Impr. Savings | Net Cost (Savings) |
|---|---|---|---|---|
| 1 Mill Road | 174,233 | ( 24,455) | ( 51,624) | 98,154 |
| 2 Mill/Custer Ave. | 222,243 | (483,260) | (127,625) | (294,317) |
| 3 East Helena/Broadway Extension | 144,399 | (265,355) | --- | (120,956) |
| 4 Beltview Drive | 120,950 | (229,585) | --- | (108,635) |
| 5 Mill/Custer/Beltview | 343,193 | (613,565) | (127,625) | (303,672) |
| 6 Sierra Drive A | 31,406 | 65,335 | ( 58,306) | 38,435 |
| 6 Sierra Drive B | 49,384 | 65,335 | ( 58,306) | 56,413 |
| Sierra A/Custer | 79,416 | (393,470) | (127,625) | (397,354) |
| Sierra B/Custer | 97,394 | (393,470) | (127,625) | (329,376) |
| Forestvale/Custer | 174,159 | (438,365) | (127,625) | (297,506) |
| Sierra A/Custer Beltview | 200,366 | (523,775) | (127,625) | (356,709) |
| Sierra B/Custer Beltview | 218,344 | (523,775) | (127,625) | (338,731) |
| Forestvale/Custer Beltview | 295,109 | (568,670) | (127,625) | (306,861) |
| Sierra A/Custer E. Helena | 223,815 | (559,545) | (127,625) | (369,030) |
| Sierra B/Custer E. Helena | 241,793 | (559,545) | (127,625) | (351,052) |
| Forestvale/Custer E. Helena | 318,558 | (604,440) | (127,625) | (319,182) |

## 5.5 ANALYSIS OF THE CROSSFIRE SCENARIO

As discussed in Chapter 2, an analysis of a development scenario for the proposed Crossfire development southeast of Helena was performed in addition to the preceding alternatives comparison. This contingency analysis was handled separately in a manual fashion.

This is because the development of the Crossfire development is not specifically reflected in HUTS zonal data on external station forecasts, with the exception of the northeasternmost portion lying within the HUTS area. This analysis did not entail the diversion of residential development from elsewhere in the HUTS area, or from the surrounding area. Depending upon where the shift in development would occur, a problem arises in double-counting because no reallocation of residential land use was possible. Since the test scenario envisions 4,600 persons residing in 1,643 residences and served by 87,500 square feet of retail space, the influence is significant and must be kept in mind through the analyses.

Traffic arising from this Crossfire scenario was developed by comparison to Zone 120 of the HUTS area because of similarity of anticipated housing types and geographic location in the area. Prorating the trips per capita from Zone 120 to the Crossfire scenario generates 18,045 daily trips to and from points outside the zone. For the retail area, a rate of 39 trips per 1,000 square feet was felt to be representative of the mix of stores which could be expected (grocery, drugs, specialty, small office) for a total of 3,410 shopping trips which were assumed to begin and end in the Crossfire area. This leaves a net of 14,635 trips to or from the development area. While the retail area would clearly intercept some of the trips from northern Jefferson County (accounted for through external Station 134), these were not deducted because to do so would have further complicated the comparative basis of the analysis. These trips were then distributed to the 17 external stations and 25 districts on the basis of the Zone 120 distribution pattern. Finally, these trip linkages were assigned to the various study alternates and the E+C network to quantify the fanning out of this Crossfire traffic on study area streets.

Access to the Crossfire scenario area was presumed to be provided by a west frontage road extending from the county line south to the East Helena Road Overpass. This link was considered to be the approach path under base or E+C conditions. The Crossfire Master Plan depicts a Beltview Drive interchange, a cloverleaf interchange on the county line, and the East Helena Road grade separation. Other principal links are a possible link from the cloverleaf north towards U.S. 12 and a road extending west from the cloverleaf to a potential linkage to Dry Gulch Road south of the city center.

The Beltview Drive interchange alternate considered in this study is consistent with the Master Plan, while the alternate proposing the East Helena Road interchange is not. However, the latter interchange has been defined for this study because the alternates are being evaluated on their advantages and disadvantages to the overall transportation system in the urban area, and utilizing any systemwide benefits as justification for public financing of the construction. It must be remembered that the basic traffic assignments do not reflect development in Crossfire in the magnitude used in this test scenario. Therefore, it was decided to take advantage

of the existing grade separation at East Helena Road in defining access alternates in this area. If the low-cost approach has little to offer in the way of system benefits, then a more costly option would not either. Of course, a substantial participation by the private sector in access improvements would, however, make other options feasible.

The traffic assignment procedure for this analysis did not presume the presence of a road connecting Crossfire with the south end of the CBD. A preliminary analysis indicated that the travel time between common end points at the I-15-East Helena Road junction and a point in the CBD indicates that the travel time would be less on an existing route. Moreover, the cost of the proposed roadway is conservatively estimated at several million dollars. At most, 2,800 daily trips from the Crossfire scenario to Districts N, O, and Q, although some external trips from these zones might be attracted to this new route. There would not seem to be a clear justification of the cost involved to serve the level of traffic which might be expected under scenario conditions.

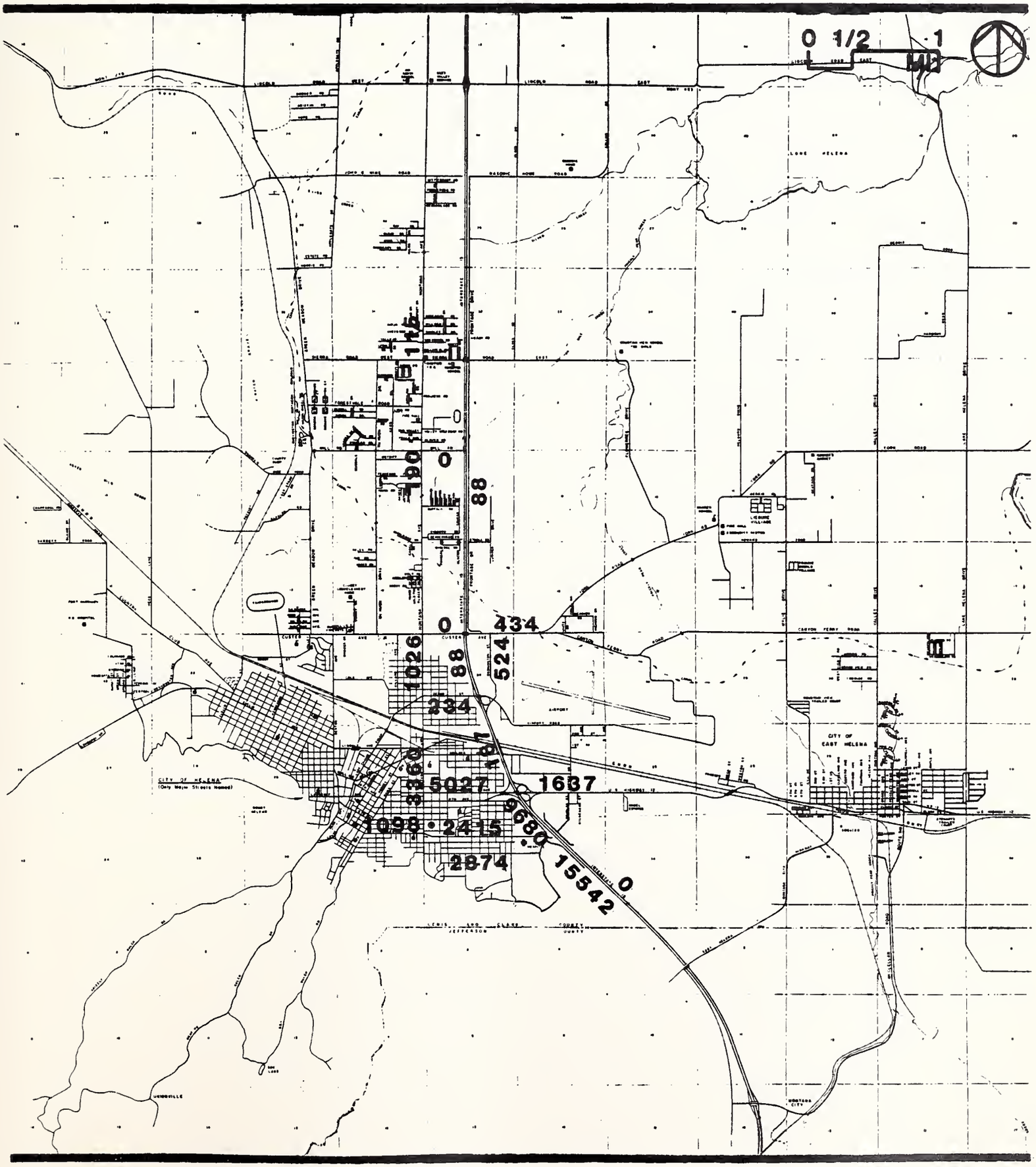
The generated volumes for the Crossfire scenario were assigned to each of the basic alternates for this study. The resulting distribution of this traffic is shown for the E+C network and each alternate in Figures 5.13 to 5.19.

These volumes were compared link-by-link to determine capacity deficiencies on the E+C network. Two were identified. Colonial Drive would require widening to form lanes between Broadway and California. Between Fee and California, 11th Street would require the capacity of a six-lane roadway.

It should be noted that the previous analysis of the six basic alternates determined that under E+C conditions, Colonial will require widening to form lanes. Thus, with the Crossfire scenario traffic, an additional two lanes are required. For costing purposes, it was presumed that Washington Street at Prospect Avenue could be extended north to 11th Street with a curvilinear alignment. Fee Street between 11th and Prospect would be one-way north, while Washington would be one-way south from 11th to Prospect. The section of 11th from Fee to Washington would become one-way eastbound. Signals would be required at Washington Street intersections with 11th and Prospect Avenues.

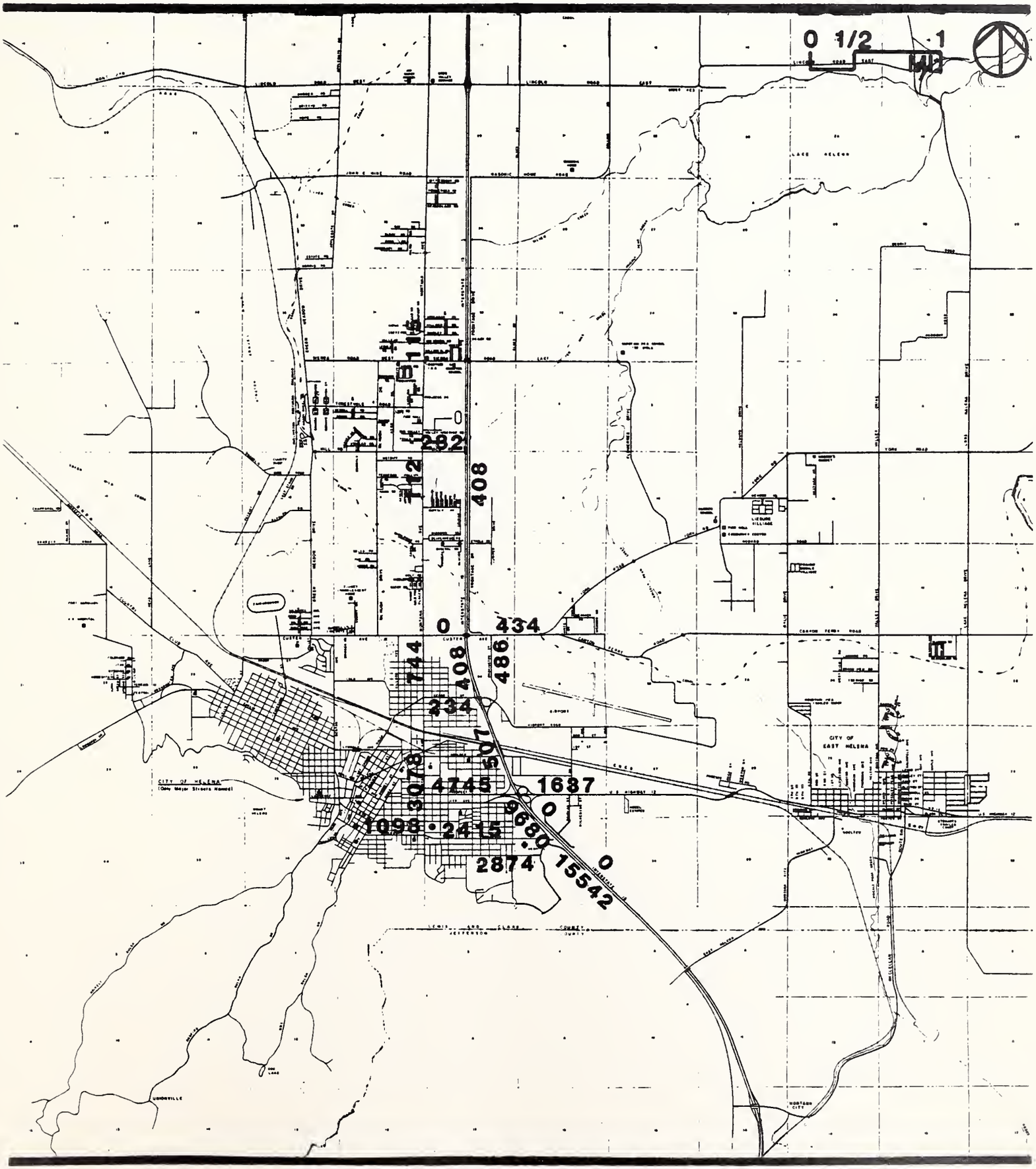
legend

# CROSSFIRE TRAFFIC VOLUMES E+C
## figure 5.13



legend

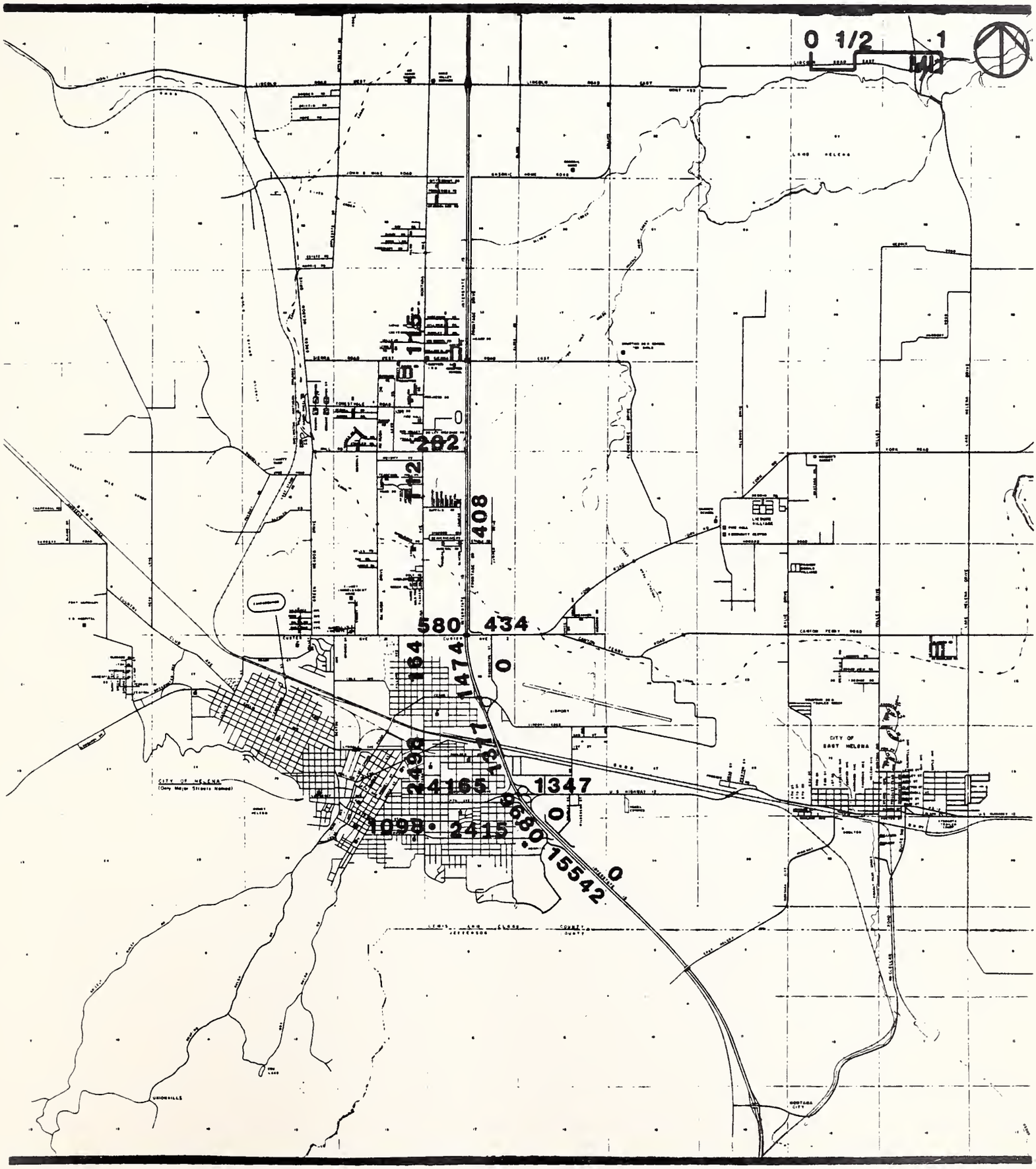
# CROSSFIRE TRAFFIC VOLUMES ALTERNATE 1
figure 5.14



legend

# CROSSFIRE TRAFFIC VOLUMES ALTERNATE 2

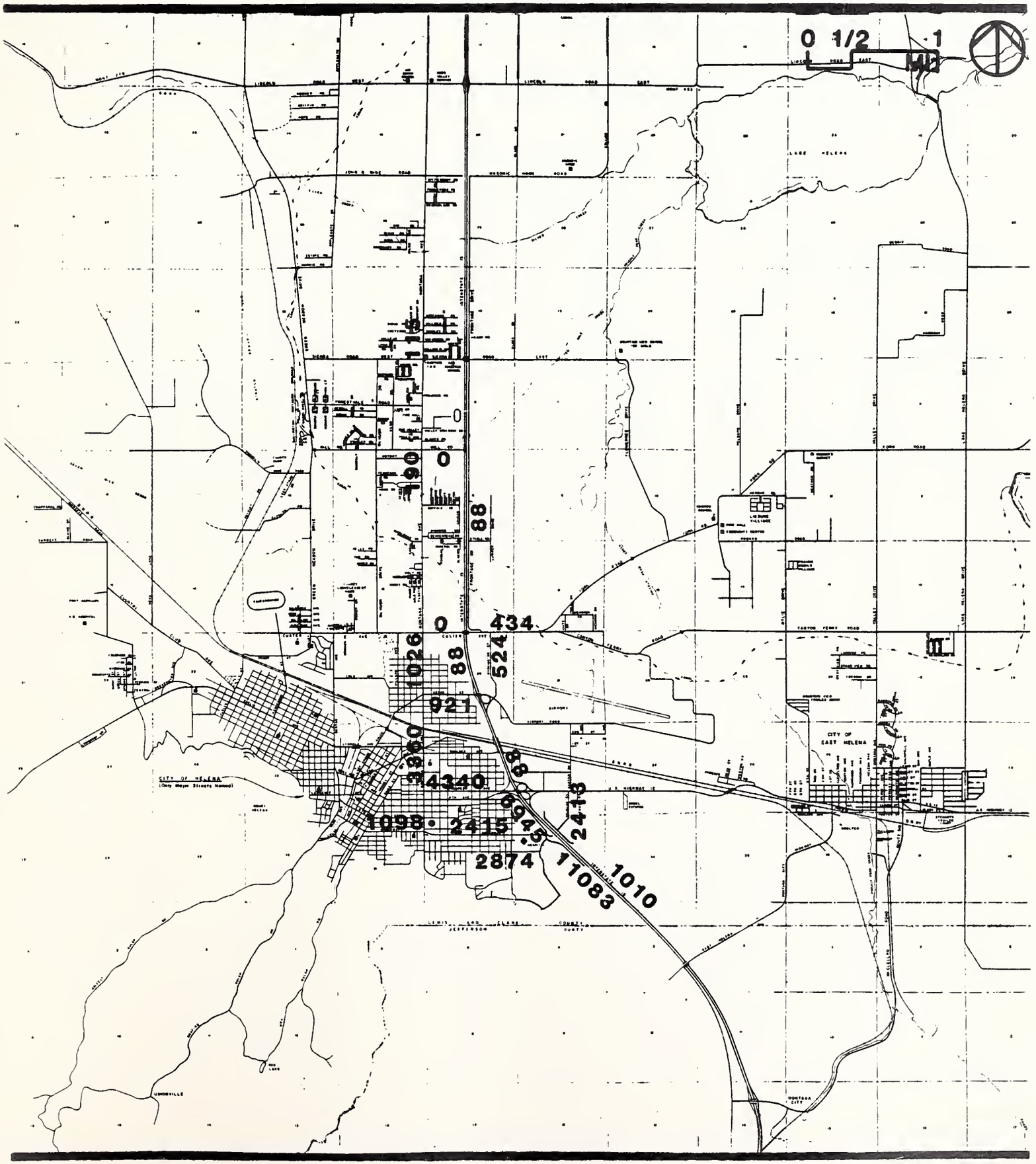
figure 5.15



legend

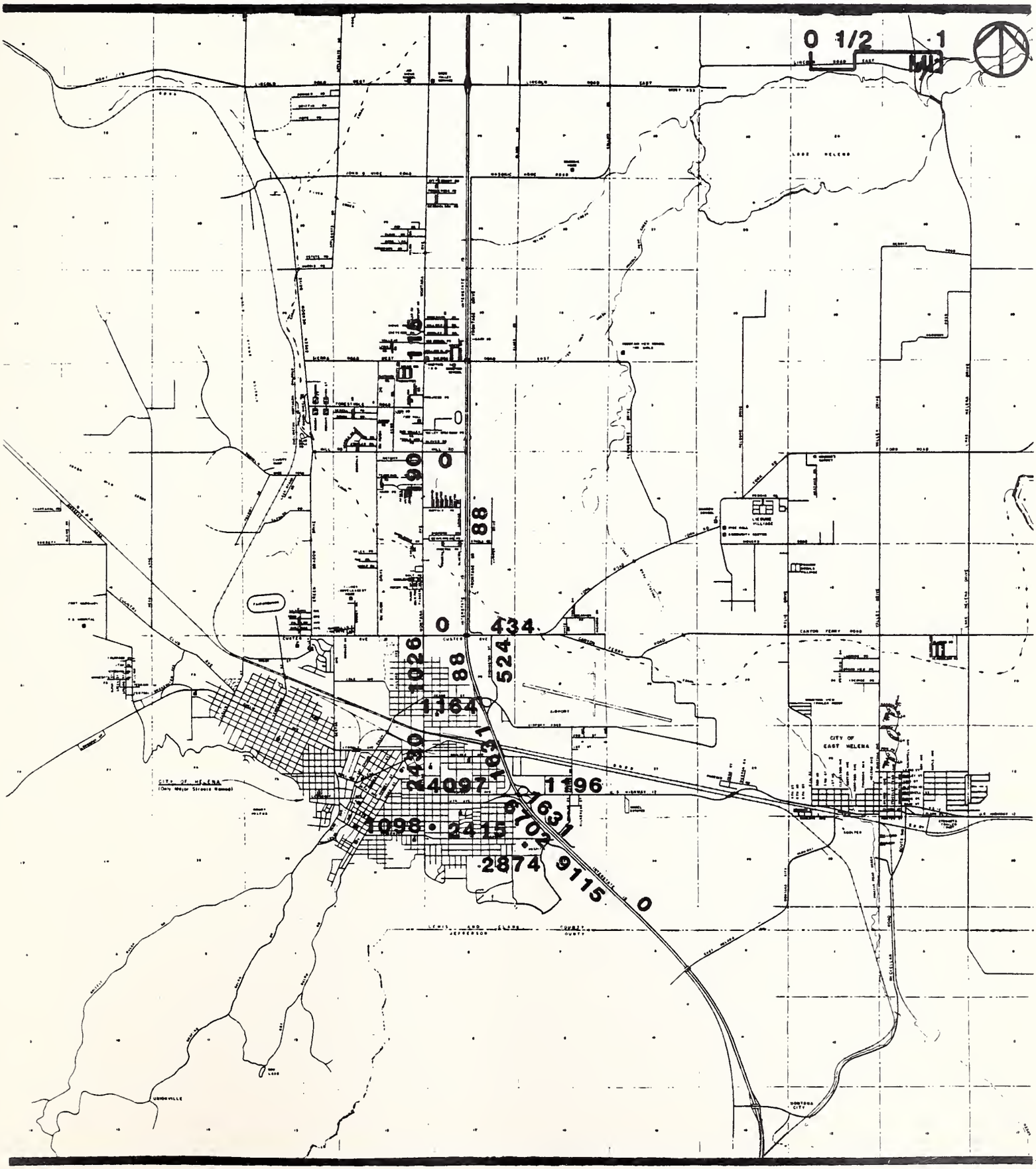
# CROSSFIRE TRAFFIC VOLUMES ALTERNATE 3

figure 5.16



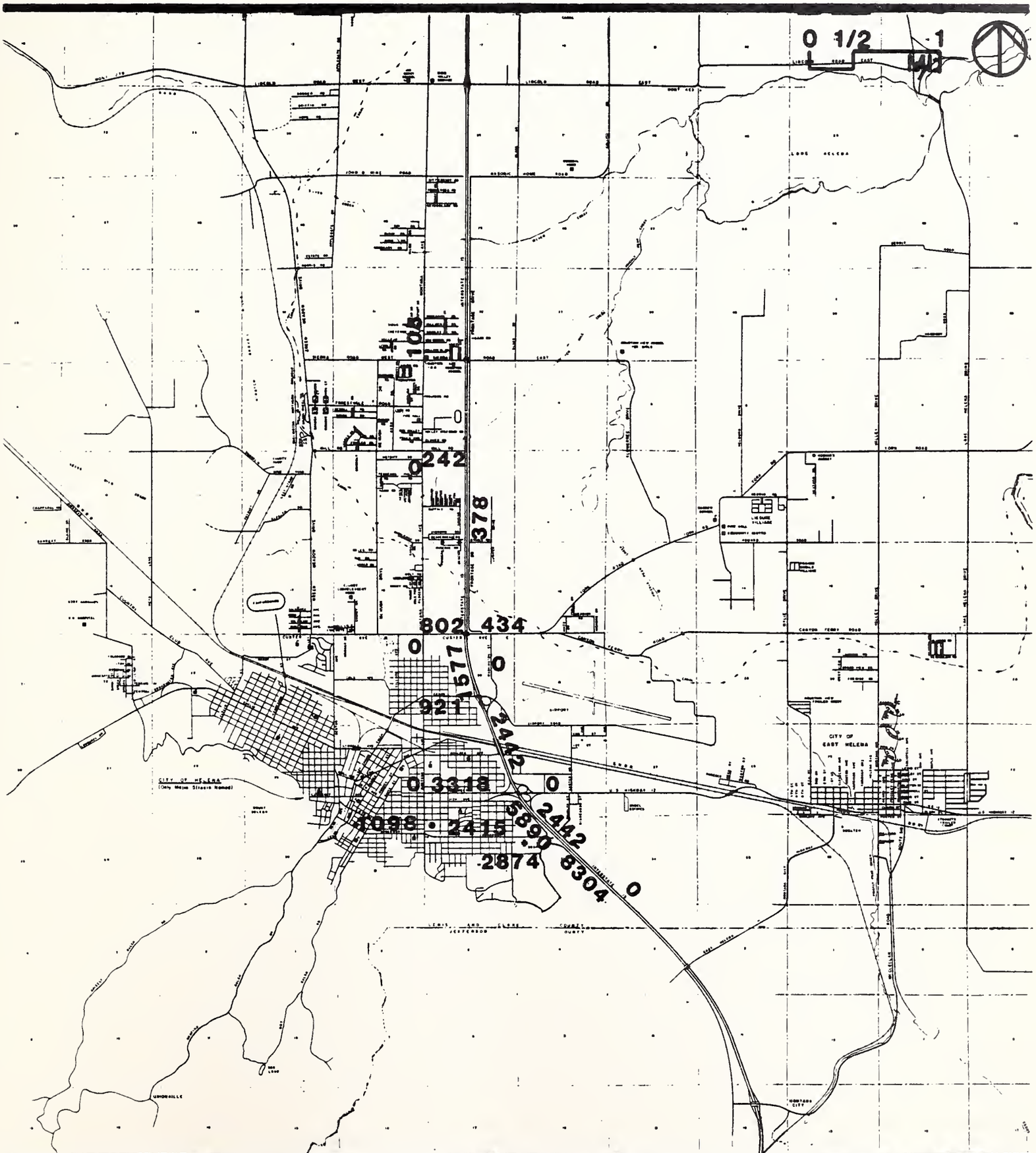
legend

# CROSSFIRE TRAFFIC VOLUMES ALTERNATE 4
figure 5.17



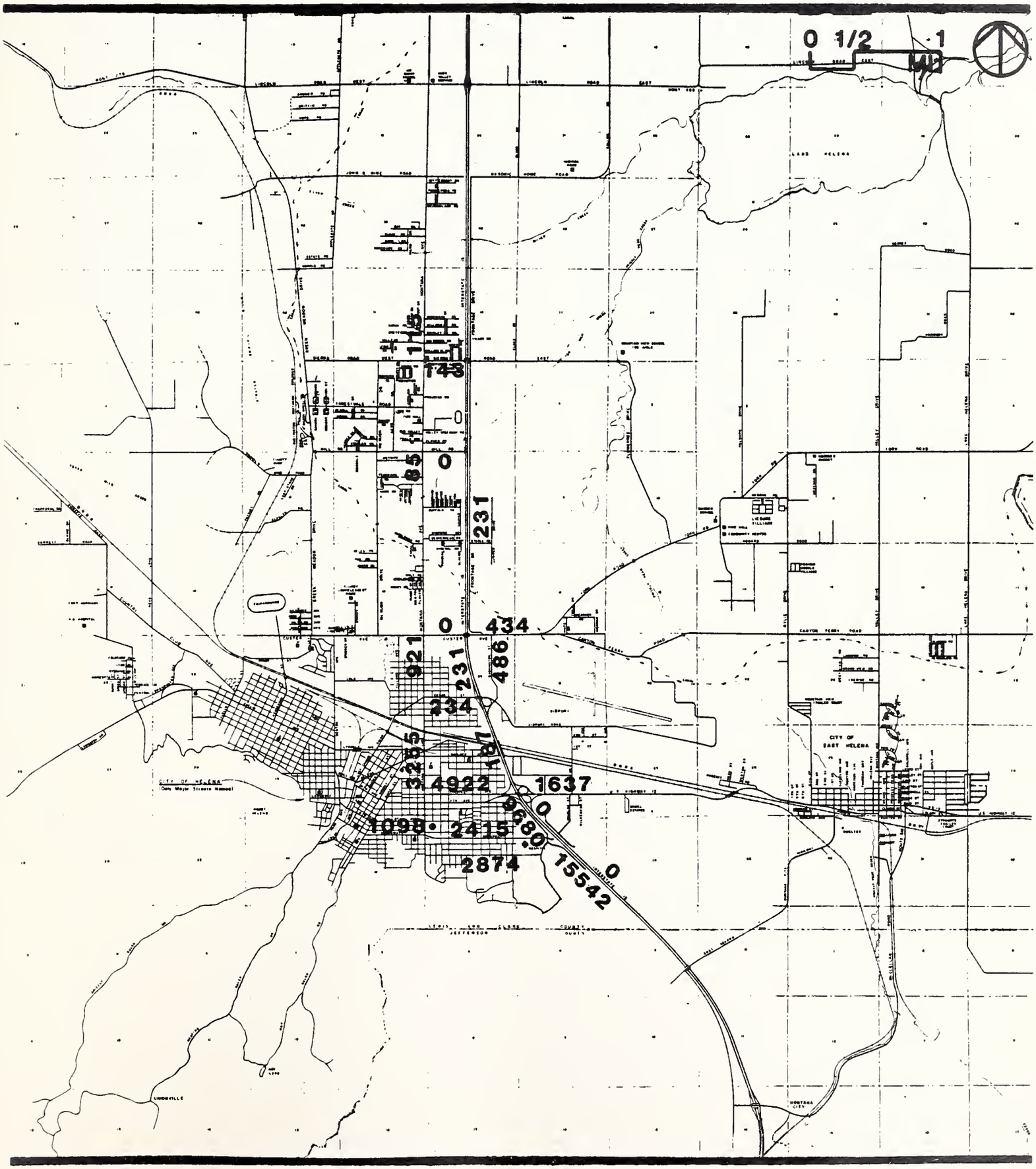
legend

# CROSSFIRE TRAFFIC VOLUMES ALTERNATE 5
figure 5.18



legend

# CROSSFIRE TRAFFIC VOLUMES ALTERNATE 6 figure 5.19



Of the six basic alternates, Alternates 3, 4 and 5 eliminate the need for this six-lane capacity section on 11th Street. These alternates do not divert sufficient Crossfire traffic from Colonial Drive to eliminate the need to widen it from California to Broadway.

Table 5.4 presents a comparison of the construction costs, system improvement costs, and net systems costs for each alternate, revised to include changes in system improvement costs relative to E+C network improvements required, considering the Crossfire traffic.

It is not possible to make definitive statements regarding the user vehicle operating costs and travel time savings associated with this scenario because of the conditions of this analysis. However, inspection of Figures 5.15, 5.17, and 5.18 indicates that varying amounts of traffic from Crossfire are diverted from Colonial Drive to I-15, the Broadway Extension, or the Beltview connection to U.S. 12, depending on the alternate. This diversion relative to E+C conditions implies reduced travel time and a probable reduction in miles traveled, both of which would indicate a net user benefit or cost savings.

TABLE 5.4

COMPARISON OF CONSTRUCTION COSTS AND SYSTEMS IMPROVEMENT SAVINGS FOR TRAFFIC ASSIGNMENTS, INCLUDING CROSSFIRE-GENERATED TRAFFIC

| Alternate | | Construction Cost ($) | Systems Improvments Savings ($)* | Net Construction Cost (Savings) |
|---|---|---|---|---|
| 1 | Mill Road | 2,010,910 | ( 558,000)[1] | 1,452,910 |
| 2 | Mill/Custer | 2,544,910 | (1,378,800)[2] | 1,166,110 |
| 3 | E. Helena/Broadway | 1,627,370 | ( 205,970)[3] | 1,421,400 |
| 4 | Beltview Drive | 1,370,520 | ( 205,970)[3] | 1,164,550 |
| 5 | Mill/Custer/Beltview | 3,915,430 | (1,584,770)[4] | 2,330,660 |
| 6A | Sierra A | 346,510 | ( 630,000)[5] | ( 283,490) |
| 6B | Sierra B | 539,720 | ( 630,000)[5] | ( 90,280) |
| | Sierra A/Custer | 881,230 | (1,378,800)[2] | ( 497,570) |
| | Sierra B/Custer | 1,074,440 | (1,378,800)[2] | ( 304,360) |
| | Forestvale/Custer | 1,980,030 | (1,378,800)[2] | 601,230 |
| | Sierra A/Custer/ Beltview | 2,251,750 | (1,584,770)[4] | 666,980 |
| | Sierra B/Custer/ Beltview | 2,444,960 | (1,584,770)[4] | 860,190 |
| | Forestvale/Custer/ Beltview | 3,350,550 | (1,584,770)[4] | 1,765,780 |
| | Sierra A/Custer/ E. Helena | 1,840,140 | (1,584,770)[4] | 225,370 |
| | Sierra B/Custer/ E. Helena | 2,033,350 | (1,584,770)[4] | 448,580 |
| | Forestvale/Custer/ E. Helena | 2,938,440 | (1,584,770)[4] | 1,354,170 |

* Relative to improvements required for E+C network; Crossfire-generated traffic requires additional improvements to basic E+C network.

1 Montana Avenue - Buffalo Road to Mill Road (3,100 L.F. @ $180/L.F.).

2 Montana Avenue - Frontier Mall to Mill Road (9,660 L.F. @ $180/L.F.).

3 Eleventh Avenue- California to Fee (Widen to six lanes from four lanes).

4 Montana Avenue - Frontier Mall to Mill Road, plus Eleventh Avenue - California to Fee.

5 Montana Avenue - Buffalo Road to Cloverleaf Road (3,500 L.F. @ $180.L.F.).

While it is not possible to quantitatively demonstrate the point, it is clear that the presence of Crossfire traffic would reinforce the merits of any alternate which included either the Beltview Drive interchange or the East Helena Road interchange. On the basis of the traffic analyses of the several alternates, it is seen that the Beltview Drive interchange diverts more traffic to I-15 because the interchange is located downstream of all Crossfire traffic, whereas some adverse travel is involved to use the East Helena interchange. However, the Broadway Underpass compensates by serving to distribute traffic from Colonial Drive to U.S. 12.

# CHAPTER 6

# CONCLUSIONS AND RECOMMENDATIONS

## 6.1 CONCLUSIONS

The criteria used to evaluate the alternate improvement packages in the preceeding chapter can be used to draw conclusions regarding the relative strengths and weaknesses of each alternate.

The alternates have been ranked according to the factors of vehicle operating cost relative to the E+C network, travel time costs relative to the E+C network, total user costs relative to the E+C network, alternate construction costs, net system construction costs, and the net composite annualized cost. The rankings indicate the relative performance of cash alternate with least cost and greatest savings as "1", with rankings decreasing with lesser performance. These summary rankings are presented in Table 6.1.

### 6.1.1 General Conclusions

A review of the traffic assignments and on the traffic diversion patterns that result from each alternate shows that U.S. 12 effectively constitutes a dividing line between "north" and "south" needs and options within the Helena Urban Area. This fact is significant because it means that to a large degree needs, options, and solutions for each area can be approached somewhat independently, taking into account any contingencies regarding major lane uses.

The principal benefit of traffic diversion north of U.S. 12 is reduction of traffic on Montana Avenue. While in the south, traffic reduction on Colonial Drive and Eleventh Avenue is the most important advantage. Little relief, however, is experienced in the projected traffic volumes on Montana from Cedar Street to the Eleventh - Prospect one-way couplet. Traffic assignments for all the alternatives also indicated that relative to the E+C traffic assignments, none of the alternatives which propose I-15 access improvements in the southeast part of Helena cause any major increase in traffic on southeast Helena streets west of California Street.

The maximum reduction in Montana Avenue traffic is 4,400 vehicle per day for Alternates 2 and 5, a large change relative to the E+C assignment. The largest increase on I-15 occurs between Custer Avenue and Cedar Street to which Alternate 5 diverts as additional 8,300 vehicles per day relative to the E+C assignment.

### 6.1.2 North Area Conslusions

Based on a study of the evaluation criteria values for alternates involving only north improvements, it can be seen that the far north interchange locations of Sierra Drive, Forestvale Road, and Mill Road, are by themselves low in effectiveness relative to user operating costs, travel time costs, and net user costs. Looking at the area north of U.S. 12 only, the most effective alternates with regard to user costs are Mill/Custer Forestvale/Custer, and Sierra/Custer resepctively. Mill Road is obviously the optimum interchange location from a standpoint of user benefits.

TABLE 6.1
SUMARY RANKING OF ALTERNATES

| | Alternate | Relative Operating Cost* | Relative Travel Time Cost* | Relative Total User Costs* | Construction Cost | Net System Construction Cost* | Net Annualized Composite Cost |
|---|---|---|---|---|---|---|---|
| 1 | Mill Road | 14 | 12 | 14 | 9 | 12 | 16 |
| 2 | Mill/Custer Ave. | 8 | 8 | 8 | 13 | 10 | 11 |
| 3 | East Helena/ Broadway Ext. | 12 | 16 | 12 | 6 | 14 | 12 |
| 4 | Beltview Drive | 13 | 13 | 13 | 5 | 11 | 13 |
| 5 | Mill/Custer/ Beltview | 2 | 1 | 1 | 16 | 16 | 9 |
| 6A | Sierra Drive A | 15 | 13 | 15 | 1 | 3 | 14 |
| 6B | Sierra Drive B | 15 | 13 | 15 | 2 | 4 | 15 |
| | Sierra A/Custer | 10 | 10 | 10 | 3 | 1 | 4 |
| | Sierra B/Custer | 10 | 10 | 10 | 4 | 2 | 6 |
| | Forestvale/ Custer | 9 | 9 | 9 | 8 | 6 | 10 |
| | Sierra A/Custer Beltview | 6 | 3 | 6 | 11 | 8 | 2 |
| | Sierra B/Custer Beltview | 6 | 3 | 6 | 12 | 9 | 5 |
| | Forestvale/Custer Beltview | 5 | 2 | 3 | 15 | 15 | 8 |
| | Sierra A/Custer E. Helena | 3 | 6 | 4 | 7 | 5 | 1 |
| | Sierra B/Custer E. Helena | 3 | 6 | 4 | 10 | 7 | 3 |
| | Forestvale/Custer E. Helena | 1 | 5 | 2 | 14 | 13 | 7 |

* Relative to the E+C Network

Regarding construction costs, the alternates which are comprised of a Sierra Drive interchange alone are the least costly, but are closely followed by the Sierra/Custer alternates. When systems improvement savings are deducted from the construction costs, the Sierra/Custer options are, by far, the most effective alternates and yield substantial net savings. Conversely, the Mill/Custer and Forestvale/Custer alternates, while promising in terms of user benefits, involve high construction costs. Net composite costs also favor the Sierra/Custer options because the relatively low construction costs and systems improvement savings for these alternates more than compensate for their lower user benefits.

Development of a Sierra/Custer alternate is also promising from a traffic standpoint because it would open up I-15 as a trunk route, with Montana Avenue and the East Frontage Road serving as parallel collector/distributors. This arrangement would act as a good system for land access.

It should be remembered, however, that potentially adverse noise impacts are associated with the north interchanges due to residential development bordering Sierra Drive and Mill Road and to the proximity of Rossiter School to the proposed Siera interchange. Preliminary noise analysis indicates increased traffic on Sierra and Mill will equal or exceed design noise levels. This issue must be resolved in further consideration of the Sierra Drive and Mill Road sites.

### 6.1.3 South Area Conclusions

Analysis of the evaluation criteria indicates that none of the alternate traffic assignments result in increased usage of Broadway Avenue relative to the E+C network despite improved circulation and I-15 access in southeast Helena. On the other hand, both the Beltview Drive interchange and an East Helena Interchange/Broadway Extension combination do significantly reduce the traffic volumes in the present bottleneck area of 11th Avenue and Fee Street. With those exceptions, increased traffic west of California Street does not occur. Neither Beltview nor East Helena/Broadway divert sufficient traffic from Colonial Drive to avoid the need to widen 11th Avenue from California to Fee, although East Helena/Broadway does effect a large reduction.

Considering alternates south of U.S. 12 along, the Beltview Drive and East Helena/Broadway Extension improvements are similar in magnitude of user operating costs, travel time, and net user costs. While the East Helena/Broadway option has a slight edge in those areas, a Beltview Drive interchange is less costly to construct. In terms of net composite costs and net costs to the system, the south improvements by themselves rank low among all alternates considered.

### 6.1.4 Crossfire Scenario Conclusions

The analysis of the Crossfire scenario does permit some limited conclusions regarding the effectiveness of the various alternates considered. Any of the alternates which include the Beltview Interchange or the East Helena Road Interchange with the Broadway Underpass would generate a net user operating cost and travel time savings for Crossfire - generated traffic. This would tend to reinforce these alternatives. Under the terms of this analysis, however, it is not known how the loss of traffic generated by residences which would have been shifted to Crossfire would affect the user cost profiles.

The evaluation of the Beltview and East Helena interchanges is complicated by the fact that private participation in interchange construction at Beltview or East Helena would alter their economic feasibility as viewed from the standpoint of public sector financing. From the standpoint of the Crossfire Master Plan, the Beltview Drive interchange would appear preferable.

### 6.1.5 Systems Conclusions

In terms of the entire system, alternates which combine a north interchange (Sierra, Forestvale, Mill) with a Custer Avenue interchange and a south interchange (Beltview, East Helena/Broadway) are ranked best from a user cost standpoint. Understandable, maximizing access to I-15 yields the greatest reduction in user operating costs, travel time costs, and net user costs.

The same alternates, as a rule, are the most expensive to construct, which is to be expected as three access points are more costly than two. These higher construction costs offset the user benefits of some of the alternatives.

Only the Sierra and Sierra/Custer alternates of all those considered yield a net savings in construction costs, with the Sierra/Custer alternates considerably more effective. Of those alternates providing three new interchange points, the Sierra/Custer/East Helena alternates are the most effective in terms of net system construction costs.

The alternates with the lowest composite net costs are the Sierra/Custer/East Helena options followed by the Sierra/Custer/Beltview alternates. All these alternates provide significant user cost savings and net composite cost savings (even if travel time savings are disregarded).

## 6.2 RECOMMENDATIONS

The study has found that of the 16 basic and other alternates discussed, four provide a net savings in street system improvements. Considering the annualized construction costs, annual user costs, and annualized system improvement costs, all but three alternates yield a new composite cost savings, even if travel time cost savings are disregarded. It is evident then that significant transportation system cost savings may be achieved by implementation of any of several alternates.

The recommendation of a specific alternate or combination of alternates is not clear cut, however. While a number of alternates access improvement concepts have been shown to be feasible, the selection of optimum course of action must reflect the collective input and judgement of the community, the City of Helena, Lewis and Clark County, Jefferson County, and the Montana Department of Highways. Such a decision will clearly involve consideration of differing viewpoints on local needs and how to best respond to those needs.

The recommendations of the Consultant cannout substitute for the local planning decision process and its determination of the most suitable alternate of those presented. However, based upon the analyses and evaluations contained in this study, the consultant offers these tentative recommendations:

1. Serious consideration should be given by the HUTS Area transportation planning process to incorporation of projects to improve access to I-15 into the revised street and highway plan and into the Transportation Improvement Program.

2. It is recommended that a package of improvements including one interchange north of Custer Avenue, an interchange at Custer Avenue, and an interchange south of U.S. 12 would provide the optimum transportation benefits to the Helena community.

3. While tradeoffs exist between the three locations for a north interchange (Sierra Drive, Forestvale Road, and Mill Road), the Sierra Road location should be favored, provided the interchange can be properly integrated with the Rossiter School site.

4. Of the two alternatives proposed south of U.S. 12 in this study, the Beltview Drive interchange is judged to be slightly superior to the East Helena Road Interchange and Broadway Underpass option in the context of anticipated land uses in the HUTS area and the potential Crossfire development area. However, the comparison criteria for alternatives containing these interchanges are relatively close in value and the decision may be based on other factors. The choice of the Beltview Interchange does not preclude the construction of an interchange at or near East Helena Road at some later date to serve Crossfire.

5. Implementation of any interchange improvements to I-15 should incorporate to the extent possible the financial cooperation of the private sector through dedicated right-of-way and contribution to construction costs where adjacent private property contributes significantly to the need or justification of the interchange.

# APPENDIX

## DISTRICT - ZONE EQUIVALENCY

| District | Composite Zones | Description |
|---|---|---|
| A | 96, 97, 122 | |
| B | 99, 101, 102 | |
| C | 98, 100, 105 | |
| D | 103, 104 | |
| E | 124 | Frontier Mall Site |
| F | 106 | |
| G | 91 | |
| H | 92, 123 | |
| I | 90 | |
| J | 93 | |
| K | 94, 121 | |
| L | 84 - 89 | |
| M | 44 - 46, 107, 108 | |
| N | 40 - 43, 109 - 113 | |
| O | 30 - 39, 114 - 119 | |
| P | 47 - 53 | |
| Q | 1 - 29 | Central Business District |
| R | 54 - 62, 70 - 73 | |
| S | 77 - 83 | |
| T | 69 | State Capitol Complex |
| U | 74 - 76 | Capital Hill Center |
| V | 67, 68 | |
| W | 63 - 65 | |
| X | 66, 95 | Hospital/Helena Mall Site |
| Y | 120 | |

# TRAFFIC ASSIGNMENT SUMMARY

| STREET SYSTEM SEGMENT | | YEAR 2000 VOLUMES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | NODES | E+C | ALT 1 | ALT 2 | ALT 3 | ALT 4 | ALT 5 | ALT 6 |
| MONTANA | N of Lincoln | 759/760 | 1210 | 1210 | 1200 | 1210 | 1200 | 1200 | 1210 |
| | S of Lincoln | 757/775 | 3240 | 3260 | 2540 | 3240 | 3240 | 2540 | 3520 |
| | | 668/667 | 3240 | 3260 | 2540 | 3240 | 3240 | 2540 | 3520 |
| | N of Sierra | 666/668 | 6560 | 6640 | 5990 | 6520 | 6560 | 5440 | 6290 |
| | S of Sierra | 666/672 | 6760 | 6680 | 6030 | 6720 | 6760 | 6030 | 6240 |
| | N of Forestvale | 672/674 | 7750 | 7700 | 7070 | 7771 | 7750 | 7070 | 6760 |
| | S of Forestvale | 674/678 | 7840 | 8160 | 7770 | 7800 | 7840 | 7770 | 6730 |
| | N of Mill | 673/681 | 9550 | 9930 | 9560 | 9510 | 9550 | 9560 | 8430 |
| | S of Mill | 681/682 | 8620 | 8060 | 5470 | 8580 | 8620 | 5470 | 7490 |
| | | 682/684 | 10150 | 8720 | 6380 | 10110 | 10150 | 6380 | 9010 |
| | | 684/686 | 12960 | 11480 | 8560 | 12920 | 12960 | 8560 | 11830 |
| | N of Frontier Mall | 686/776 | 14350 | 13050 | 10120 | 14490 | 14530 | 10120 | 13390 |
| | S of Custer | 619/638 | 17860 | 16290 | 14000 | 17800 | 17860 | 14000 | 16490 |
| | N of Cedar | 618/202 | 18300 | 16620 | 14320 | 18240 | 18300 | 14320 | 16990 |
| | Cedar-Chestnut | 624/202 | 10210 | 9820 | 9170 | 10120 | 10210 | 9170 | 9860 |
| | N of Lyndale | 625/626 | 12730 | 12340 | 11690 | 12550 | 12700 | 11670 | 12380 |
| | N of Prospect | 336/338 | 24350 | 24030 | 23260 | 24010 | 24330 | 23240 | 24030 |
| | N of Broadway | 553/554 | 6320 | 6290 | 6250 | 6300 | 6320 | 6250 | 6300 |
| | | | | | | | | | |
| | | | | | | | | | |
| I-15 | N of Lincoln | ~~768/769~~ 777/778 | 4430 | 4430 | 4430 | 4430 | 4430 | 4430 | 4430 |
| | Lincoln-Mill | ~~524/523~~ | 5230 | 5200 | 5920 | 5220 | 5220 | 5920 | * |
| | Mill-Custer | | 5230 | 8100 | 12610 | 5220 | 5220 | 12610 | 7870 |
| | Custer-Cedar | | 5230 | 8100 | 13540 | 5220 | 5220 | 13540 | 7870 |
| | Cedar-I15-12 | ~~519/518~~ | 15540 | 16210 | 17710 | 15420 | 15660 | 17830 | 16070 |
| | I15-12-Beltview | | 6870 | 6870 | 6870 | 5410 | 7840 | 7860 | 6870 |
| | Beltview-East Helena | | 6870 | 6870 | 6870 | 5410 | 6870 | 6870 | 6870 |
| | East Helena-Montana City | | 6870 | 6870 | 6870 | 6650 | 6870 | 6870 | 6870 |
| | S. of Montana City | | 5000 | 5000 | 5000 | 5000 | 5000 | 5000 | 5000 |
| East Frontage | N of Sierra | 755/662 | 380 | 380 | 380 | 380 | 380 | 380 | 380 |
| | Sierra-Mill | | 2100 | 2110 | 2070 | 2140 | 2100 | 2070 | 830 |
| Mill (Centroid 91) | -Custer | 660/636 | 3740 | 2370 | 1830 | 3780 | 3740 | 1830 | 2470 |
| | Washington St. | 218/749 | 11762 | 10180 | 7320 | 11920 | 11760 | 7320 | 10490 |
| | Airport Way | 218/222 | 5850 | 5540 | 4810 | 6360 | 6340 | 4870 | 5670 |
| | Carter Lane | 748/747 | 3000 | 2700 | 1480 | 3560 | 2950 | 1920 | 2840 |

*6870 before adjustment

*4930 Lincoln-Sierra
7870 Sierra-Mill

# TRAFFIC ASSIGNMENT SUMMARY

| STREET SYSTEM SEGMENT | YEAR 2000 VOLUMES | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | NODES | E+C | ALT 1 | ALT 2 | ALT 3 | ALT 4 | ALT 5 | ALT 6 |
| Lincoln F.D - W of Montana | 758/759 | 1770 | 1770 | 1770 | 1770 | 1770 | 1770 | 1770 |
| Montana - I-15 | 761/762 | 2780 | 2170 | 1940 | 2780 | 2780 | 1940 | 2460 |
| E of - I-15 | 765/766 | 1120 | 1120 | 1120 | 1120 | 1120 | 1120 | 1120 |
| Sierra DR - W of Montana | 754/670 | 480 | 470 | 440 | 480 | 480 | 440 | 620 |
| W of East Frontage | 662/663 | 640 | 470 | 420 | 690 | 650 | 420 | 2340 |
| E of East Frontage | 661/662 | 1440 | 1440 | 1440 | 1440 | 1440 | 1440 | 1440 |
| MILL RD - W of McHugh | 642/694 | 1680 | 2220 | 1660 | 1690 | 1690 | 1600 | 1710 |
| McHuah - Montana | 680/681 | 1170 | 1700 | 1080 | 1170 | 1170 | 1080 | 1190 |
| Montana - I-15 | | — | 3880 | 5210 | — | — | 5210 | — |
| I-15 - East Frontage | | — | 2560 | 2110 | — | — | 2110 | — |
| Green Meadow - N of Custer | 268/646 | 3310 | 3560 | 2810 | 3310 | 3310 | 2810 | 3200 |
| McHugh LN - N of Custer | 640/683 | 2520 | 2240 | 1940 | 2580 | 2580 | 1940 | 2460 |
| Benton Ave. - S of Custer | 644/2666 | 4870 | 4860 | 4860 | 4970 | 4870 | 4860 | 4830 |
| Custer Ave. - W of Green Meadow | 646-650 | 7220 | 7400 | 7390 | 7230 | 7230 | 7390 | 7160 |
| Benton - McHugh | 640/642 | 10740 | 10380 | 10980 | 10840 | 10740 | 10930 | 10430 |
| Villard - Montana | 638-771 | 11260 | 10570 | 11000 | 11360 | 11260 | 11000 | 10860 |
| Montana - I-15 | 773 — | 8830 | 7070 | 12150 | 8960 | 8830 | 12150 | 8090 |
| I-15 - East Front | 636 | 8830 | 7070 | 6740 | 8960 | 8830 | 6740 | 8090 |
| E of Washington St. | 635/779 | 8740 | 8740 | 8740 | 8740 | 8740 | 8740 | 8740 |
| Cedar St. - W of Montana | 200/202 | 16960 | 16790 | 16990 | 17110 | 16980 | 17010 | 17070 |
| Montana - I-15 | 208/210 | 16550 | 15160 | 13700 | 16790 | 16620 | 13760 | 16490 |
| Lyndale Dr - Montana - No Main | 320/322 | 16510 | 16510 | 16390 | 16350 | 16510 | 16390 | 16510 |
| 11th Ave. - W of Montana | 398/400 | 7660 | 7660 | 7660 | 7660 | 7650 | 7650 | 7660 |
| W of Lamborn | 406/408 | 12450 | 12440 | 12400 | 12410 | 12400 | 12350 | 12460 |
| E of Fee | 410/411 | 13080 | 13180 | 13320 | 9060 | 11600 | 11830 | 13200 |
| Prospect Ave - W. of Lamborn | 344/346 | 13620 | 13750 | 13780 | 12960 | 13440 | 13600 | 13730 |
| E of Fee | 348/350 | 13710 | 13980 | 14610 | 10730 | 10300 | 11200 | 13950 |
| E. of 15 | 356/416/427/431 | 21270 | 21580 | 22300 | 20020 | 19305 | 20350 | 21450 |
| Broadway W of Montana | 552/554 | 8340 | 8340 | 8350 | 8640 | 8510 | 8510 | 8340 |
| E of Lamborn | 566/568 | 5200 | 5170 | 5130 | 5670 | 5500 | 5440 | 5190 |
| W of California | 568/570 | 3370 | 3370 | 3370 | 4150 | 3690 | 3690 | 3370 |
| W of Colonial Drive | 738/739 | 2060 | 2060 | 2060 | 3450 | 2500 | 2500 | 2060 |
| Colonial Drive - I-15 | | | | | 6530 | — | — | — |
| | | | | | | | | |
| | | | | | | | | |

# TRAFFIC ASSIGNMENT SUMMARY

| STREET SYSTEM SEGMENT | YEAR 2000 VOLUMES NODES | E+C | ALT 1 | ALT 2 | ALT 3 | ALT 4 | ALT 5 | ALT 6 |
|---|---|---|---|---|---|---|---|---|
| Winne Ave-Montana Oakes | 582/584 | 2310 | 2305 | 2260 | 2330 | 2310 | 2260 | 2310 |
| W. of California | 576/578 | 2210 | 2230 | 2270 | 2580 | 2240 | 2310 | 2220 |
| W. of Saddle Dr. | 731/735 | 1340 | 1340 | 1340 | 2280 | 1500 | 1500 | 1540 |
| Belt View Dr.-N of California | 729/730 | 1040 | 1040 | 1040 | 1110 | 1070 | 1070 | 1040 |
| E of California | 730/732 | 5540 | 5540 | 5540 | 4340 | 4220 | 4200 | 5540 |
| Saddle-Colonial | | | | | 160 | 1400 | 1400 | |
| Colonial-US12 | | | | | | 1910 | 1910 | |
| Colonial Dr.-Fee-California | 409/741 | 18340 | 18370 | 18410 | 11970 | 13800 | 13850 | 18350 |
| California-Broadway | 740/738 | 9500 | 9500 | 9500 | 5590 | 6580 | 6580 | 9500 |
| Broadway-Belview | | — | — | — | 800 | 3570 | 3570 | — |
| Belview-East Helena | | — | — | — | 960 | — | — | — |
| East Helena-Mont. City | | — | — | — | — | — | — | — |
| California-Broadway-Colonial | 570/740 | 6750 | 6770 | 6810 | 4300 | 5150 | 5200 | 6760 | |
| " - Winne | 570/576 | 5340 | 5310 | 5410 | 3500 | 3860 | 3910 | 5350 |
| Winne - Belview | 576/730 | 4510 | 4510 | 4510 | 3230 | 3150 | 3130 | 4510 |

# TRAFFIC ASSIGNMENT SUMMARY - CROSSFIRE

| STREET SYSTEM SEGMENT | | YEAR 2000 VOLUMES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | NODES | E+C | ALT 1 | ALT 2 | ALT 3 | ALT 4 | ALT 5 | ALT 6 |
| Montana | N of Lincoln | 759/760 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| | S of Lincoln | 757/775 | 10 | 10 | 10 | 10 | 10 | — | 10 |
| | | 668/667 | 10 | 10 | 10 | 10 | 10 | — | 10 |
| | N of Sierra | 666/668 | 115 | 115 | 115 | 115 | 115 | 105 | 115 |
| | S of Sierra | 666/672 | 115 | 115 | 115 | 115 | 115 | 105 | 10 |
| | N of Forestvale | 672/674 | 115 | 115 | 115 | 115 | 115 | 105 | 10 |
| | S of Forestvale | 674/678 | 190 | 190 | 190 | 190 | 190 | 180 | 35 |
| | N of Mill | 678/681 | 190 | 190 | 190 | 190 | 190 | 180 | 25 |
| | S of Mill | 681/682 | 190 | 112 | 112 | 190 | 190 | — | 85 |
| | | 682/684 | 190 | 112 | 112 | 190 | 190 | — | 85 |
| | | 684/686 | 292 | 10 | 10 | 292 | 292 | 234 | 187 |
| | N of Frontier Mall | 686/776 | 424 | 142 | 142 | 424 | 424 | 234 | 314 |
| | S of Custer | 619/638 | 1026 | 744 | 164 | 1026 | 1026 | — | 321 |
| | N of Cedar | 618/202 | 1026 | 144 | 164 | 1026 | 1026 | — | 321 |
| | Cedar-Chestnut | 624/202 | 1713 | 1431 | 851 | 1713 | 1470 | — | 1608 |
| | N of Lyndale | 625/626 | 1713 | 1431 | 851 | 1713 | 783 | — | 1608 |
| | N of Prospect | 336/338 | 3360 | 3078 | 2498 | 3360 | 2430 | — | 3250 |
| | N of Broadway | 553/554 | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| I-15 | N of Lincoln | | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| | Lincoln-Sierra | | 88 | 88 | 88 | 88 | 88 | 88 | 88 |
| | Sierra-Mill | | 88 | 88 | 88 | 88 | 88 | 48 | 231 |
| | Mill-Custer | | 85 | 408 | 408 | 88 | 88 | 378 | 231 |
| | Custer-Cedar | | 88 | 408 | 1474 | 88 | 88 | 1577 | 231 |
| | Cedar-U.S.12 | | 187 | 507 | 1377 | 88 | 1631 | 2442 | 187 |
| | U.S. 12-Beltview | | — | — | — | 1010 | 1631 | 2442 | — |
| | Beltview-E Helena | | — | — | — | 1010 | — | — | — |
| | | | | | | | | | |
| E. Frontage | N of Sierra | 755/662 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| | Sierra-Mill | | 38 | 38 | 38 | 38 | 38 | 38 | - |
| | Mill-Custer | 660/636 | 90 | 52 | 52 | 90 | 90 | 52 | 52 |
| | Washington | 218/749 | 524 | 486 | — | 524 | 524 | — | 486 |
| | Airport Way | 218/222 | 290 | 290 | 290 | 201 | — | — | 290 |
| | Carter Lane | 748/747 | 340 | 340 | 50 | 340 | 151 | 151 | 340 |

# TRAFFIC ASSIGNMENT SUMMARY – CROSSFIRE

| STREET SYSTEM SEGMENT | | YEAR 2000 VOLUMES NODES | E+C | ALT 1 | ALT 2 | ALT 3 | ALT 4 | ALT 5 | ALT 6 |
|---|---|---|---|---|---|---|---|---|---|
| Lincoln Rd. | W. of Montana | | 28 | 28 | 28 | 28 | 28 | 28 | 28 |
| | Montana-I-15 | | 28 | 28 | 28 | 28 | 28 | 28 | 28 |
| | E. of I-15 | | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| Sierra Dr. | W. of Montana | | | | | | | | |
| | W. of E. Frontage | | — | — | — | — | — | — | 143 |
| | E. of E. Frontage | | | | | | | | |
| Mill Rd. | W. of McHugh | | | | | | | | |
| | McHugh-Montana | | — | — | — | — | — | 62 | |
| | Montana-I-15 | | — | 282 | 282 | — | — | 218 | |
| | I-15-E. Frontage | | — | 38 | 38 | — | — | 38 | |
| Grn. Meadow | N. of Custer | | 22 | 22 | 22 | 22 | 22 | 22 | 22 |
| McHugh Ln. | N. of Custer | | | | | | | | |
| Benton Ave. | S. of Custer | | | | | | | | |
| Custer Ave. | W. of Grn. Meadow | | — | — | — | — | | 28 | — |
| | Benton-McHugh | | 265 | 265 | 265 | 265 | 265 | 28 | 265 |
| | Villard-Montana | | 265 | 265 | 265 | 265 | 265 | 28 | 265 |
| | Montana-I-15 | | — | — | 580 | — | — | 802 | — |
| | I-15-E. Frontage | | — | — | 486 | — | — | 486 | — |
| | E. of Washington | | 434 | 434 | 434 | 434 | 434 | 434 | 434 |
| Cedar St. | W. of Montana | | | | | | | | |
| | Montana-I-15 | | 234 | 234 | — | 921 | 1164 | 921 | 234 |
| Lyndale St. | Montana-N. Main | | 1646 | 1646 | 1646 | 1646 | 1646 | 1618 | 1646 |
| 11th Ave. | W. of Montana | | | | | | | | |
| | W. of Lamburn | | 5027 | 4745 | 4165 | 4340 | 4097 | 3318 | 4922 |
| | E. of Fee | | 2048 | 2330 | 2910 | 1003 | — | 52 | 215.3 |
| Prospect Ave. | W. of Lamburn | | 5027 | 4745 | 4165 | 9340 | 4097 | 3318 | 4922 |
| | E. of Fee | | 2048 | 2330 | 2910 | 1003 | — | 52 | 215.3 |
| U.S. 12 | E. of I-15 | | 1637 | 1637 | 1347 | — | 1196 | — | 1637 |
| Broadway | W. of Montana | | 1098 | 1098 | 1098 | 1098 | 1098 | 1098 | 1098 |
| | E. of Lamburn | | 2078 | 2078 | 2078 | 2078 | 2078 | 2078 | 2078 |
| | W. of California | | 2415 | 2415 | 2415 | 2415 | 2415 | 2415 | 2415 |
| | W. of Colonial Dr. | | 2415 | 2415 | 2415 | 2415 | 2415 | 2415 | 2415 |
| | Colonial Dr-U.S.12 | | — | — | — | 2413 | — | — | — |
| | | | | | | | | | |
| | | | | | | | | | |

# TRAFFIC ASSIGNMENT SUMMARY – CROSSFIRE

| STREET SYSTEM SEGMENT | | YEAR 2000 VOLUMES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | NODES | E+C | ALT 1 | ALT 2 | ALT 3 | ALT 4 | ALT 5 | ALT 6 |
| Winne Ave. | Montana-Oakes | | | | | | | | |
| | W. of California | | 2360 | 2360 | 2360 | 2360 | 2360 | 2360 | 2360 |
| | W. of Saddle Dr. | | 2874 | 2874 | 2874 | 2874 | 2874 | 2874 | 2874 |
| Beltview | W. of California | | | | | | | | |
| | E. of California | | 575 | 575 | 575 | 575 | 575 | 575 | 575 |
| | Saddle-Colonial | | — | — | — | 3450 | 3450 | 3450 | — |
| | Colonial-US 12 | | — | — | — | — | 1347 | 1347 | — |
| Colonial Dr. | Fee-California | | 9680 | 9680 | 9680 | 6945 | 6702 | 5890 | 9680 |
| | California-Broadway | | 9680 | 9680 | 9680 | 6945 | 6702 | 5890 | 9680 |
| | Broadway-Beltview | | 15542 | 15542 | 15542 | 11083 | 9115 | 8304 | 15542 |
| | | | | | | | | | |
| California | Broadway-Colonial | | | | | | | | |
| | Broadway-Winnie | | | | | | | | |
| | Winnie-Beltview | | | | | | | | |

J. W. Hahn

FORM 4 A

**INTER-DEPARTMENTAL MEMORANDUM**

**DEPARTMENT OF HIGHWAYS**

To J. W. Hahn, P. E., Chief
Planning & Research Bureau

From Stephen C. Kologi, P. E., Chief
Preconstruction Bureau

Date July 21, 1980

Subject I 15 Corridor Study
Helena

This is in reply to your memo of July 14, 1980.

Probably the biggest problem with the study as we see it is that it does not appear that either the geometrics or cost estimates are realistic.

The consultant should rough out geometrics with profiles and then prepare estimates from them. Two examples of geometric problems are the Custer ramps and the northbound on ramp at Sierra.

At Custer there probably isn't sight distance enough to hook the ramps in so close to the structure. It would seem better to connect them at the bottom of the fill. Also, if they are drawn to scale they seem awful short.

At Sierra surely they wouldn't propose a slip ramp the wrong way (off the left side) of a two way frontage road. Here again the ramps seem too short.

So we repeat. First they should prepare realistic geometrics and right of way requirements and then make estimates from them. We sure don't want to lead people to believe that certain things are feasible and cost a certain amount and then find out that they just weren't feasible and that an adequate facility will cost millions more.

Were the road user computations based on an interchange <u>at</u> Mill Road or north of Mill Road as shown on the sketch?

The 50 foot section they propose for four lanes really isn't wide enough. The "Red Book" offers guidance in this area.

Sierra A & B seem to be mixed up. The narrative, pictures, and estimates don't match.

The problem of the close spacing of Cedar and Custer must be addressed. I don't think it was even mentioned. This would seem to be a significant problem since the two crossroads would be considerably closer together than the FHWA's minimum spacing.

30-SCK/js

cc J. R. Beckert
K. F. Skoog
G. L. Larson

Stephen C. Kologi

Stephen C. Kologi, P. E., Chief
Preconstruction Bureau

MONTANA DEPARTMENT OF HIGHWAYS
Helena, Montana

MEMORANDUM

TO: DISTRIBUTION BELOW

FROM: James W. Hahn, Chief, Planning and Research Bureau

RE: I-15 Corridor Study - Helena
File: 752.14

DATE: July 14, 1980

The attached preliminary draft report regarding the subject study is provided for your review and comment.

The report basically documents the analyses, evaluations and comparison of several alternatives considered by HDR for improving access to I-15. Your review and comment would be appreciated by July 21, 1980. DOH comments will be submitted to the consultant by this office and also discussed at the July 22, 1980 TAC meeting.

Public informational meetings are tentatively scheduled to be held on July 29, 30 and 31, 1980 pertaining to the study. Should you be interested in attending either the TAC meeting or public information meetings you may obtain meeting times and place from this office.

Should have any questions regarding the attached you can contact Keenan Bingham of my office, extension 3740.

JWH:KB:sh

DISTRIBUTION
R.P. Richards
J.R. Beckert
H.G. Wheeler
S.C. Kologi
R.C. Champion
D.D. Gruel
C.R. Mackey

HDR

Henningson, Durham & Richardson, Inc. of Montana

EBC Professional Center
2225 Eleventh Ave., Suite 17
Helena, MT 59601
(406) 442-7400

July 14, 1980

Mr. James W. Hahn, P.E.
Chief, Planning and Research Bureau
Montana Department of Highways
Helena, Montana 59601

Re: Helena I-15 Corridor Study
Draft Report

Dear Jim:

The attached draft study report documents the analyses, evaluations, and comparison of several alternatives for improving access to I-15. Eleven (11) copies are furnished for your use; the balance of the reports will be hand distributed to TAC members.

Very truly yours,

HENNINGSON, DURHAM & RICHARDSON, INC.

Kenneth L. Anderson

Kenneth L. Anderson

Attachment

KLA:de

Architecture
Engineering
Planning
Systems
Ecosciences

Alexandria
Atlanta
Austin
Charlotte
Chicago
Dallas
Denver
Helena
Knoxville
Minneapolis
New Orleans
Norfolk
Omaha
Pensacola
Phoenix
Santa Barbara
Seattle
Washington, D.C.

File: 752.14
Helena
I-15 Corridor Study